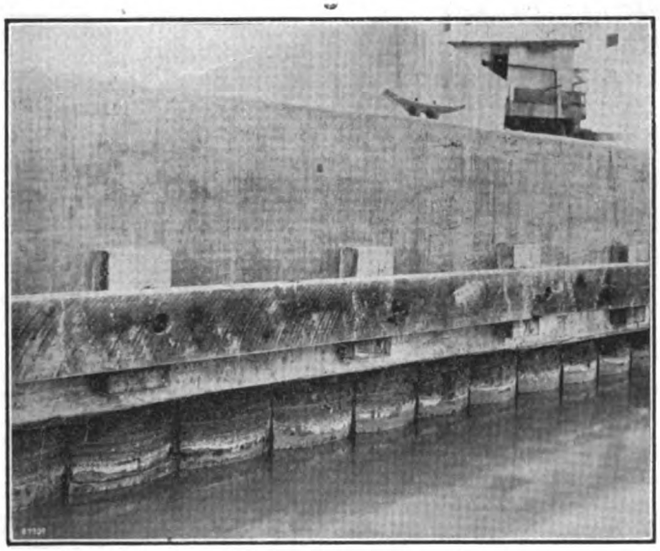
THE MARINE REVIEW

VOL. 41 CLEVELAND APRIL, 1911 NEW YORK No. 4

NEW INTERLOCKING CONCRETE PILES

A CONCRETE dock recently built for the Interlocking Steel Form Co., at Ellston and Webster avenues, on the north branch of the Chicago river, Chicago, illustrates very fully the new system of interlocking pile construction patented by Henry W. Schlueter. The dock has a length of 100 ft., a depth of 18 ft., and is built in 18 ft. of water, with concrete piles and tubes 26 ft. in length. Fifty-three piles were used on the front and nine on each side. The tops of the piles extend 18 in. above low mean water. In alternate rows, the piles are brought up to 18 in. above the adjacent ones.



SHOWING DETAIL OF FRONT OF DOCK.

In constructing this dock holes were drilled through 4 ft. of limestone and blue clay beneath to a depth of 26 ft. below the water level. The holes were made by a patented water jetty cutter having a diameter of 26 in., with overlapping lips. Cutter, concrete mixer and equipment were mounted on a scow, 26 ft. wide by 50 ft. long, fitted with a hinged platform on the right side. An 85-h. p. Dayton boiler, Lidgerwood 35-h. p. double drum hoisting engine, one 1,100-gal. Burnham steam-driven pump, a Lidgerwood reversible engine and a Milwaukee concrete mixer with a capacity of 100 cu. yds. per hour are used in placing the piles, as well as sinking the holes. Two separate vertical frames are installed, one supporting the concrete mixer and conveyor and the other the steel frame head enclosing the drilling mechanism. The engines and boiler, as well as the pumps, are housed in a wooden house set just back of the uprights.

A horizontal countershaft leads from the reversing engine to the drill. This shaft is 3½ in. in diameter and runs at the same speed as the engine, 208 revolutions per minute, being geared to the engine with a 12-in. spur gear having an 8-in. face. Connecting with this horizontal shaft by level gears and running at the same speed as the engine, is a 4-in. square vertical shaft supported in an upright position in a lateral steel tower and sliding in leads held by bronze brushed spiders. The square shaft slides through the level gear.

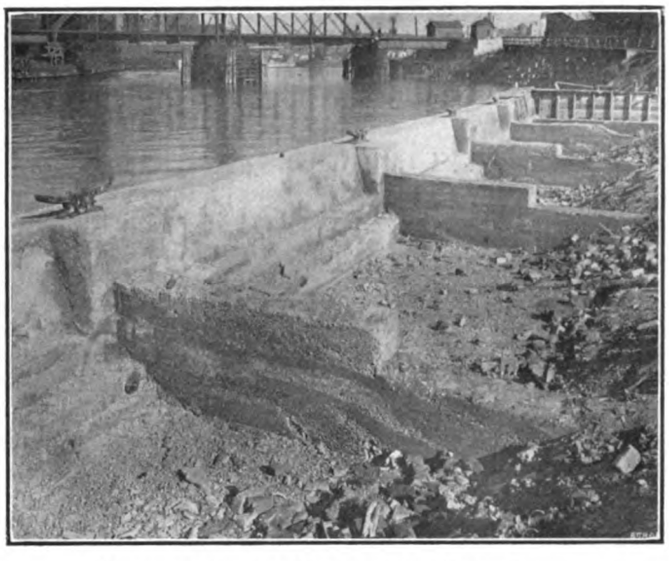
The entire cage is lifted or lowered vertically by ropes connected to a worm gear on the horizontal countershaft. Two speeds are available on this worm gear and the head can be lowered at the rate of ¼ in. per revolution and ½-in. per revolution, respectively, the latter being accomplished by using a single line. Clamped to the lateral cage are two 2½-in. galvanized pipes leading down to the cutter lead branch where they terminate 8 in. above the cutter lead in four jets, two of which shoot downward and two backward at an angle of 45 deg. The cutter is cast steel, fitted with 14 tool steel cutters in two arms, each cutter being 4 in. long. This hydraulic excavator has a capacity of 50 tubes a day and has been patented

by H. W. Schlueter. One foreman, one engineer, one fireman, one signal man, one mixer and two linemen are required to operate the machine.

After jetting and sinking in a hole, a tube is set in place hanging in the leads of the frame. The tube shell hanging in the leads is filled with concrete and dropped. A 26-ft. tube weighs 7,800 lb.

In the dock at Webster avenue 60 cu. yds. of concrete were used in the tubes and 185 cu. yds. in all. After a three weeks set the tubes were tested by a side pressure of 1,000 lb. per sq. ft. without any apparent deflection.

The construction used in building this dock is such that the completed work forms a solid and continuous wall. Each tube or casing has on one end or side a hollow vertical rib and on the other side a hollow vertical socket, both of which dovetail to make an interlocking system. The rib of one pile enters the groove of the next, locking them together. As the rib and groove are hollow and form a part of the tube, the separate concrete piles in the tubes are locked



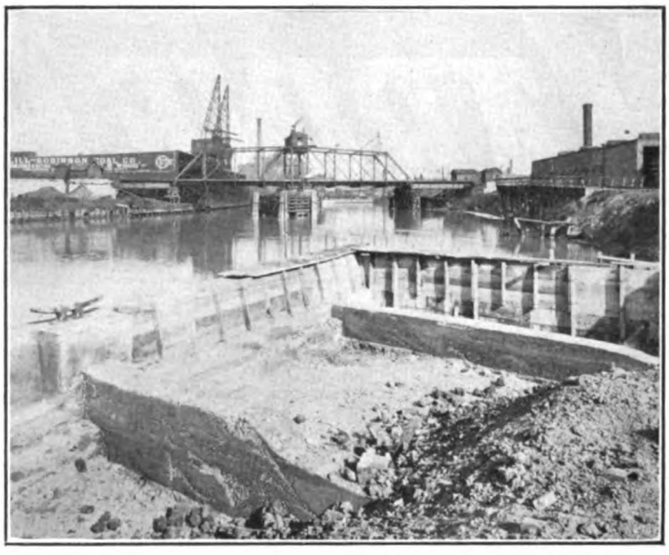
SHOWING CLEATS, GIRDERS AND FACE GIRDER.

together, and do not depend upon the steel shell for their strength to lock them together.

For land work the cylinders are open at the bottom, and the faces of the rib and groove are open (the sides being tied together by transverse strips). With this arrangement, the concrete filling forms a monolithic mass (above the surface of the ground), and may have horizontal and diagonal reinforcing rods embedded within it. This arrangement is used in water where there is no danger of scouring. In this case, the tube does not displace the material and the concrete filling does not extend below the bottom of the lake or river.

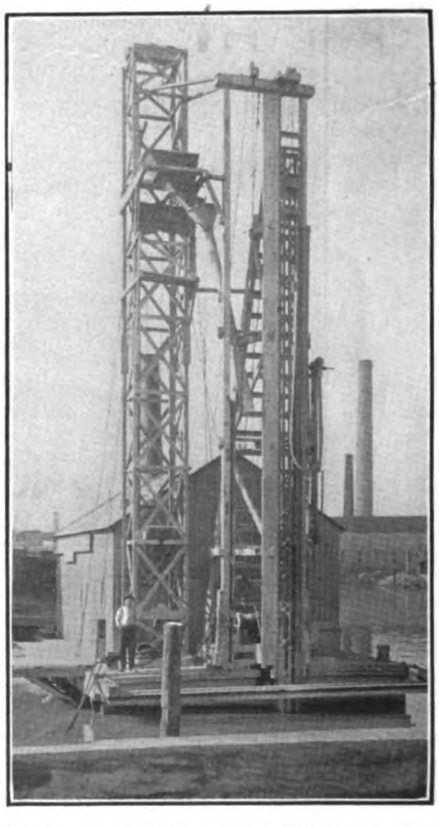
For work in the water, exposed to the action of waves and currents, the tube has a closed flat bottom and closed faces to the rib and groove, so that the concrete filling forms a separate pile, interlocking with the adjacent piles, and reinforced by vertical rods as may be required. The standard size is 20 in. diameter and the shells are built of No. 24 black sheet steel, reinforced by interior rings of steel or malleable iron. They may be made of any desired length.

In the construction of work with the closed piles, a timber pile is put down at the starting point, and has on its face a steel groove to receive the rib or tongue of the first steel tube. The tube is swung into position by a crane or derrick and the bottom of its tongue is inserted into the false groove on the timber pile. It is then



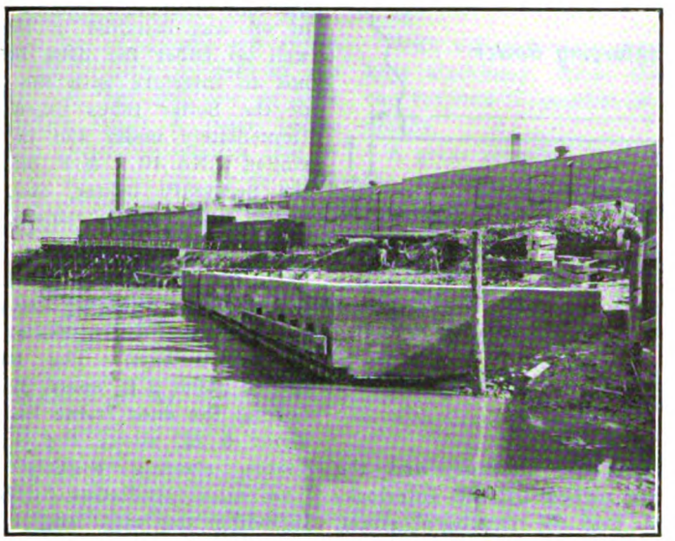
DOCK SHOWING REINFORCED GIRDER.

lowered until it reaches the water and the concrete filling is commenced, causing the tube to sink. The top of the filling is kept about 12 to 24 in. above the water level. When the pile reaches the bed of the lake or river the sinking is assisted by water jets, and the tube put down to the required depth. The next tube is sunk in



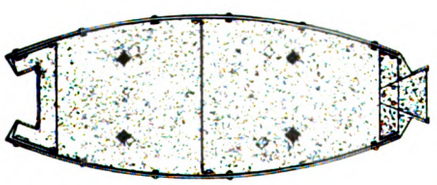
THE SCOW CONTAINING DRILLING AND PILE MAKING EQUIPMENT.

the same way. The concrete filling for the upper part of the tubes may be deferred until a number of tubes are in place. The piles have flat bottoms, and no pile driver is used. In very stiff ground, the sinking of the tube may be assisted by transferring to it the weight of a water tank used in connection with the sinking jets.



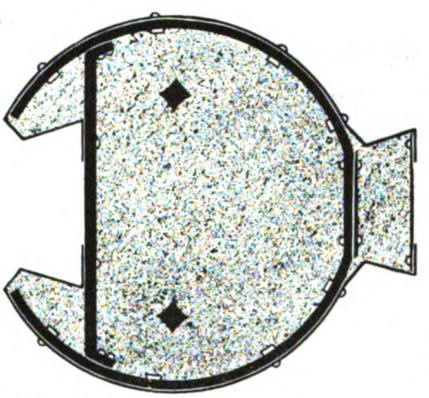
THE COMPLETED DOCK.

The open tubes are sunk in much the same way, but of course without concrete filling. The resistance is much less as only the shell penetrates the material. When the tubes have been placed for a certain length of work, the longitudinal steel bars (horizontal or diagonal) are placed in position, and the concrete filled in to form a wall from the level of the ground to the top of the steel tubes. The timber end pile in this case is fitted with a steel rib or tongue instead of a groove, so that each pile has its tongue forward when the concrete is deposited. The purpose of this is to make the weight of concrete spread or spring the steel sides of the tongue outward and force them into tight contact with the groove of the adjacent pile. This prevents any leakage of cement or concrete at the joint. The end or closing pile of any piece of work has only a tongue (or groove) on one side, the other side having a cylindrical surface.



SECTION OF OVAL INTERLOCKING TUBE.

Two types of piles are used, the standard 20-in. interlocking tube and a modified design having an oval shell, 12 x 24, in. reinforced with ½-in. galvanized cables. The oval tubes were used in the dock at Webster avenue. On the bottom of the tubes are 14 x 14-in. plates through which are fastened the reinforcing cables. The tubes are watertight, being welded for salt water work.



STANDARD SIZE 20-INCH INTERLOCKING TUBE.

Back of the piles in the dock described, an earth filler was thrown reaching nearly to the top of the piles. On the top of the piles a reinforced concrete girder, 7 ft. high above the water line was cast. This girder is reinforced with 16 ½-in. galvanized cables. The girder is 2 ft. wide at the top and 5 ft. at the base, while the width at the base of the inside vertical slope is 3 ft., with a step 1 ft. wide placed just above the base.

On the earth fill a concrete or floor 12 in. thick and 12 ft. in width is cast in place. This sheet ends in a caisson anchor 2 ft. deep and 2 ft. wide set 12 ft. back. This slab is ultimately covered with earth.

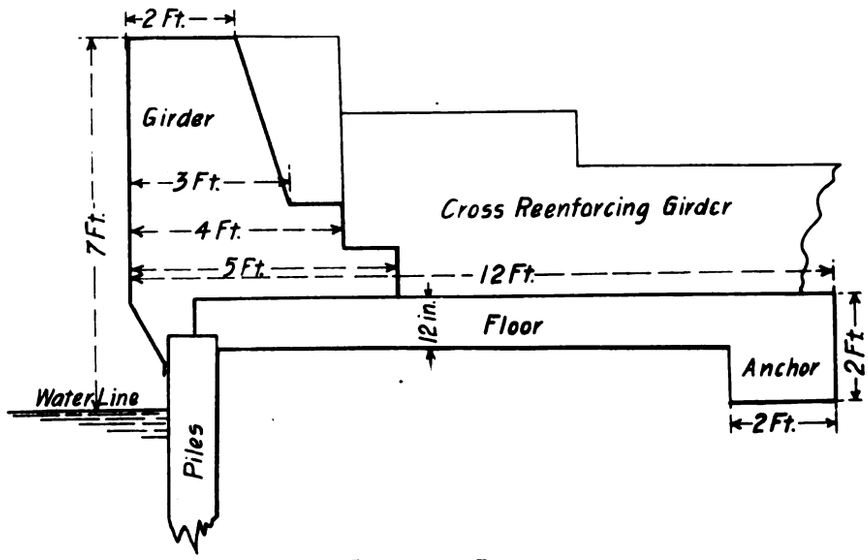
Every 20 ft. a vertical reinforced concrete girder 16 in. in width and 4 ft. high reinforces the wall girder proper, being set at right angles to it. These girders end 35 ft. inland in caissons which are simply holes, 4 ft. in diameter and 6 ft. below the datum plane, filled with concrete. Cleats are fastened to the girder wall by two ¼-in. bolts and lock nuts on the top. These bolts are secured in the wall, by ¼-in. anchor plates 8 in. square. One-half in. galvanized cables are used throughout in reinforcing this dock.

On the outside face of the wall a buffer strip of 6 x 12-in. oak is bolted on 6 x 12-in. blocks, 2 ft. above the water line. This buffer is secured by bolts with leads countersunk and spaced on 4-ft. centers passing through the wall girder.

At Thorndale avenue and Sheridan drive, Chicago, on Lake Michigan, a design of interlocking supporting piles are used. A line of 12-ft. piles at each end, at right angles to the main wall, serves to retain the sand filling which was discharged into the enclosed space by a suction dredge. The made ground was used as a building site. The piles in this case are inclined, the proper slope being given by two wailing timbers against which the shell rested while being driven. At each seventh pile there is an inside brace pile, 12 x 24 in., inclined in the opposite direction. The wall piles are 16 ft. long and the brace piles 12 ft. long. Upon the top of the wall is built a concrete girder 36 in. thick and 4 ft wide, bonded to the concrete piles by vertical rods. The face of the girder is so shaped as to throw back the water of heavy waves striking the wall.

An interesting application of this system of construction is for jetties on the lake shore of Lake Michigan at Rogers Park, built for the park board of that place. There are seven jetties extending 125 ft. to 150 ft. from the shore and spaced 80 ft. apart. They are at an angle of 22 deg. north of due east, in order to meet the northeast storms. In two weeks after their completion the sand deposited had formed about an acre of new land. Each jetty is a single row of open-tube piles, 16 x 24 in., with reinforcing rods laid at an angle of 45 deg. in a vertical plane, the concrete forming a monolithic wall. For the last 20 ft. of each jetty, however, closed piles 12 ft. long were used.

This style of jetty construction was originally devised for river regulation



SECTION OF DOCK.

and shore protection work on the Mississippi river. The plan was to run the jetties upstream at an angle with the shore line to form still-water bays in which the sand and silt would be deposited.

The system of steel and concrete pile construction described above has been invented and patented by Henry W. Schlueter, of Chicago, and the patents are owned by the Interlocking Tube Co., 79 Dearborn street, Chicago. The construction work is carried out by the Interlocking Concrete Construction Co., of which William H. Mulholland is president. Mr. Schlueter is engineer for both companies.

Remarkable Economy of an Oil Fuel Installation

BY C. A. MCALLISTER.*

EVERY engineer knows or believes that oil fuel is in many instances much more economical than coal, and the following description will cover what is presumed to be a noteworthy example toward this general belief. Furthermore it is thought that the method of application to be described is the first instance of the use of one of its kind; at any event, the writer has no knowledge of a similar oil fuel burning plant.

The revenue cutter Golden Gate, on which this successful experiment has been tried, is a vessel of the ordinary harbor tug type, and is engaged in boarding duty in San Francisco harbor. This is an intermittent duty involving daily a number of short trips around the harbor, a state of readiness to go at a moment's notice, and consequent lying at a wharf with steam up for the greater portion of the time. This tug is 110 ft. long and up to six months ago, was provided with a water tube boiler of the Ward type, and a triple-expansion engine capable of producing 550 maximum indicated horsepower.

*Engineer in chief United States revenue cutter service.

RELATIVE FUEL CONSUMPTION FOR THREE MONTHS ENDING DEC. 31, 1909, AND DEC. 31, 1910.

	1909 (with coal.)	1910 (with oil.)
Banked fires	1945 hrs. 45 min.	1705 hrs. 45 min.
Underway	238 hrs. 15 min.	190 hrs. 15 min.
Total miles steamed	2030	1604
Fuel expense	128.6 tons	253.7 bbls.
Cost of coal at $5.40 per ton		$694.44
Cost of oil at $0.60 per bbl		153.32
Net saving for three months		$541.12
Percentage saved by use of oil		77.8

The subject of oil fuel for the Golden Gate had been frequently broached by those in charge, but the lowest estimate for transforming the coal bunkers into oil tanks was $15,000, an amount deemed prohibitive in view of the small sums available for repairs, and to the further fact that the vessel when new in 1896 cost only $50,000. As the old boiler had to be renewed last year, a new Babcock & Wilcox water tube boiler was installed, and during its installation the following scheme was thought out and put into application.

A small cylindrical tank with a capacity of approximately 23 barrels of oil was installed in the fireroom, well up under the deck beams so as not to interfere with the withdrawal of the boiler tubes when necessary. Immediately under the tank was installed a No. 10 S. & P. oil pump with the necessary heater, coil, governor, relief, gage, tank, strainers, etc.

The boiler is equipped with grate bars, etc., complete, the same as it would be for burning coal, with the exception that fire bricks are laid over the grate bars. The burners are spaced about 2 ft. apart, project 12 in. beyond the door frame liners and are about 6 in. above the level of the grates, slanting slightly downward. The entire installation for burning oil, including the tank and its supports and all incidental expenses necessary to make the apparatus ready for use was only $2,500. The advantage of this installation may be summarized as follows:

1. Its non-interference with the coal-burning appliances; the regular coal bunkers not being disturbed, and in fact 10 tons of coal are carried in bags to trim the ship. In case the oil supply should run out, coal could be immediately burned, after removing the fire bricks off the grate bars and disconnecting the oil burners. If the vessel should go on a long voyage or be transferred to some port where fuel oil was not available there would be nothing to interfere with coal burning.

2. The oil supply, small as it is, is sufficient for four or five days steaming under ordinary circumstances. The oil is furnished from a pipe line on the wharf where the Golden Gate is moored and the tank can be filled in 10 minutes.

3. Owing to the small amount of oil carried, the danger from fire is minimized.

4. The great decrease in cost of installation; $2,500 for complete apparatus as against $15,000 for the cost of

tanks alone, if the coal bunkers had been transformed into oil tanks.

5. The marked saving in fuel bills when compared to coal, as will now be shown.

It will be seen from the accompanying tabulation that during the period in question the vessel did not steam as many miles under oil fuel as she did under coal, nor was she so long under banked fires. A much better comparison as to the relative cost of coal and oil as fuels can be deducted from the performances of November, 1909, and November, 1910, which were as follows:

PERFORMANCE DURING NOVEMBER, 1909, AND NOVEMBER, 1910.

	Nov. 1909 (with coal.)	Nov. 1910 (with oil.)
Hours underway per day, average	4	3
Knots per hour	8.5	8.5
Total miles cruised per day	34	25.5
Banked fires, hours	620.5	464.2
Fuel used per day, average lbs.	4726	1205
Fuel used per day while underway	3600	975
Fuel used per day under banked fires	1126	230
Cost of fuel per day for steaming (coal at $5.40 per ton)	$8.40	
Cost of fuel per day for steaming (oil at $0.60 per bbl.)		$1.73
Cost per mile	24 cts.	6.9 cts.
Cost of oil compared with coal, per mile	28 per cent	
Saving per mile	72 per cent	
Miles steamed per ton of coal at 8.5 knots	21.2	
Miles steamed per ton of oil at 8.5 knots	58.5	

From the foregoing tabulations it is clear that the cost of the oil fuel is only slightly in excess of one-fourth the cost of coal under the former condition, which, to say the least, is a remarkable saving. A further reduction in the cost of operation of the machinery, due to the use of oil fuel, comes from the fact that the personnel has been reduced from four men to three, by dispensing with the services of one coal passer, whose annual wages, subsistence, etc., cost the government $674.

At the saving indicated by the returns from the first quarter of the operation of the oil plant there will undoubtedly be an annual saving in fuel alone of $2,160; this with the reduction of $674 for labor will make a total annual saving of $2,834, due almost entirely to the installation of apparatus the first cost of which was only $2,500.

The following notes and excerpts from the report of the engineer officer in charge of the steam machinery may prove of interest in connection with the operation of this plant, viz.:

The new boiler is well adapted for the use of oil as fuel, because of the flame baffling system, combined with the large volume of the combustion chamber. This allows the sprayed oil ample opportunity to effect a complete combustion, and passes the products of combustion to the stack at a low temperature. Under ordinary conditions there is no smoke. After the boilers had been in operation for two months the quantity of dirt and soot removed would not fill a 2-quart can. The heating surfaces were almost as clean as when new, while with coal they would have been congested with soot.

With oil the steam pressure can be kept stationary, while the machinery can respond to unusual or varying demands.

A great economy is effected through the careful use of the damper. The fire-bricks act as an accumulator of heat and about 20 gallons of oil will maintain steam at about 100 lbs. pressure for 24 hours, thus holding steam easily at night.

From water at 56 degrees Fahr. steam is raised in one hour, with the middle burner operated as slowly as possible and using an inappreciable amount of oil.

The proper adjustment of the fire bricks over the grate bars is important. They are laid flat, and lengthwise across the grates. The five rows back are laid close together and three extra rows are added for ordinary steaming. The remainder are laid in the same manner, with a space of three or four inches between each new row, depending on the amount of air required. If too much air is admitted oil is wasted, and if too little the burners give out a dark flame and sputter. The air supply must be balanced with the steam supply to get the best results.

The oil in the tank is about 80 degrees Fahr. It is delivered to the burners at about 150 degrees Fahr. under a pressure of 40-60 lbs., depending on the work required.

The efficiency of the entire system is dependent on the regularity of the oil supply. If through any cause the pump is not operated uniformly, no amount of attention will avail at the burners.

The oil used is the California product known as "Richmond Fuel," and the following are its physical prperties and chemical analysis:

ULTIMATE ANALYSIS.

Carbon	87.78 per cent.
Hydrogen	10.75 per cent.
Sulphur	0.75 per cent.
Nitrogen	0.34 per cent.
Oxygen	0.38 per cent.
Moisture	0.10 per cent.

PHYSICAL PROPERTIES.

Specific gravity	0.952
Flash point	190-F.
Fire point	280-F.
Calorific value B. T. U.	18,648

Honolulan's Long Trip

Seattle, Mar. 20.—Seldom does a new vessel steam 14,000 miles without the need of stopping for repairs or overhauling, but such is the record made by the American-Hawaiian Steamship Co.'s new passenger liner Honolulan, built by the Maryland Steel Co., Sparrows Point, Md., for the Hawaiian trade. It is true that the Honolulan made a stop of ten hours at Punta Arenas but this was not caused by the engines but to give the vessel opportunity to get the desired tide on which to negotiate a passage through the Strait of Magellan and also to allow Capt. T. P. Colcord to cable to his owners.

In addition to steaming the entire distance without a mishap, the Honolulan also achieved the somewhat unique distinction of arriving on Puget Sound with 2,000 barrels remaining of the 14,000 barrels of fuel oil which she took when she left Baltimore. The steamer Missourian, of the same fleet, carried sufficient oil to steam her from the east coast to Puget Sound two years ago but it is not often that such a record has been made. The fast steamers Harvard and Yale, which recently arrived on this coast from New York, burned both oil and coal and it was necessary for them to make frequent stops for coal. However, the Honolulan steamed steadily and while her engine crew tuned up the machinery during the vessel's short stay at Punta Arenas, this was the only time that the engines were stopped during the long run from coast to coast.

During most of the long run, only two of the Honolulan's boilers were in service and the steamer was run at a low and economical speed. This was for the double purpose of conserving her fuel supply and to shake down the engines. On two boilers, at 62 revolutions, she averaged about 11 knots while under three boilers, and about 70 revolutions, she steamed between 12.5 and 13 knots, a performance satisfactory to owners and officers. She was under three boilers in the Strait of Magellan when it was necessary to have a maximum of power and after she crossed the

equator in the Pacific, the third boiler was again placed in service.

In addition to performing very satisfactorily with boilers and engines, the new steamer's wireless, a two kilowatt United Wireless set, 60 cycle, was in almost constant communication with either shore stations or other steamers during the long run of 54 days. The best record made on the Atlantic in direct sending and receiving was at a distance of somewhat over 1,000 miles with the steamer Bermudian. On the Pacific the longest distance at which direct communication was established was with the shore station at Los Angeles, 1,400 miles away. For more than a week, the Honolulan was in direct communication with the steamers Yale and Harvard at distances between 1,000 and 1,100 miles. At much greater distances, the wireless set on the Honolulan picked up messages but the record of the passage for long distance was with Los Angeles. On the Atlantic, there was considerable static disturbance which interfered with communication. Probably one of the most remarkable feats accomplished by the Honolulan was reporting herself to her owners in New York, when she was off the Mexican coast in longitude 110 West. This was done by first picking up the Ward liner Merida, then in the Gulf of Mexico, which in turn reported the Honolulan through Hatteras to New York. At the time, on the Isthmus of Mexico, between the Honolulan and Merida was a mountain 17,000 feet in height, which, however, did not seem to interfere with the aerial waves.

Approaching her destination, the submarine bell signal on the Honolulan was found to work splendidly, the Columbia river and Umatilla lightships being picked up from nine to 14 miles away. This system is now on all the American-Hawaiian steamers in the Pacific and it is found a great assistance in approaching this coast especially in foggy weather which prevails during much of both the winter and summer seasons.

Waternymph's Oil Burning Installation

ONE of the interesting incidents in the installation of oil burning machinery in the vessels on the Pacific, which is going on continually, is the transforming of the Waternymph, the first iron vessel built on the Pacific coast, from a coal burner to an oil burner.

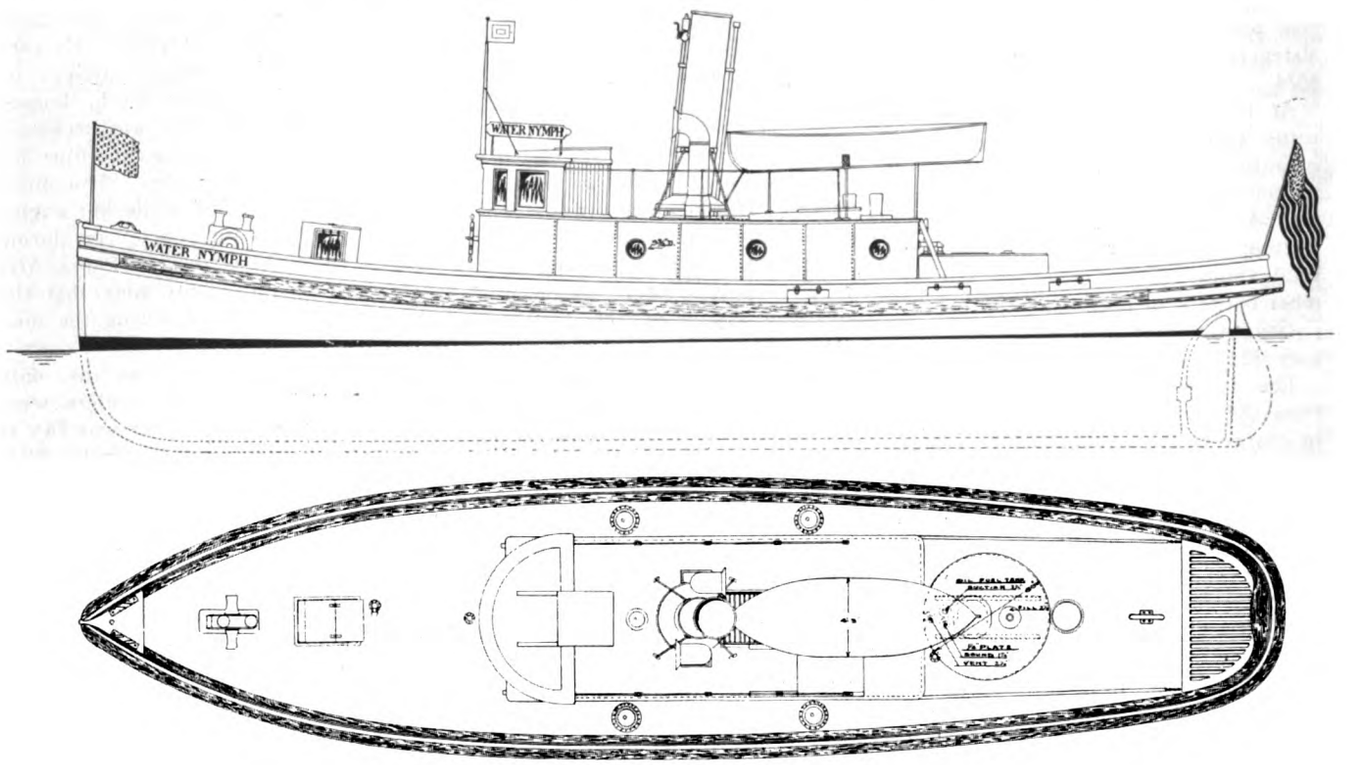
The Waternymph was originally designed by James Dickie, father of the firm of D. W. & R. Z. Dickie, who made the plans for the present oil-firing installation. She was built in 1881 in the boiler shop of the Risden Iron Works, in San Francisco, by the previous generation of the family now in charge, for the firm of Goodall, Perkins & Co., the firm name including that of the present senior senator of California.

She was built to carry water to the shipping in San Francisco bay at a time when there would be as many as 150 sailing ships lying at anchor in the bay.

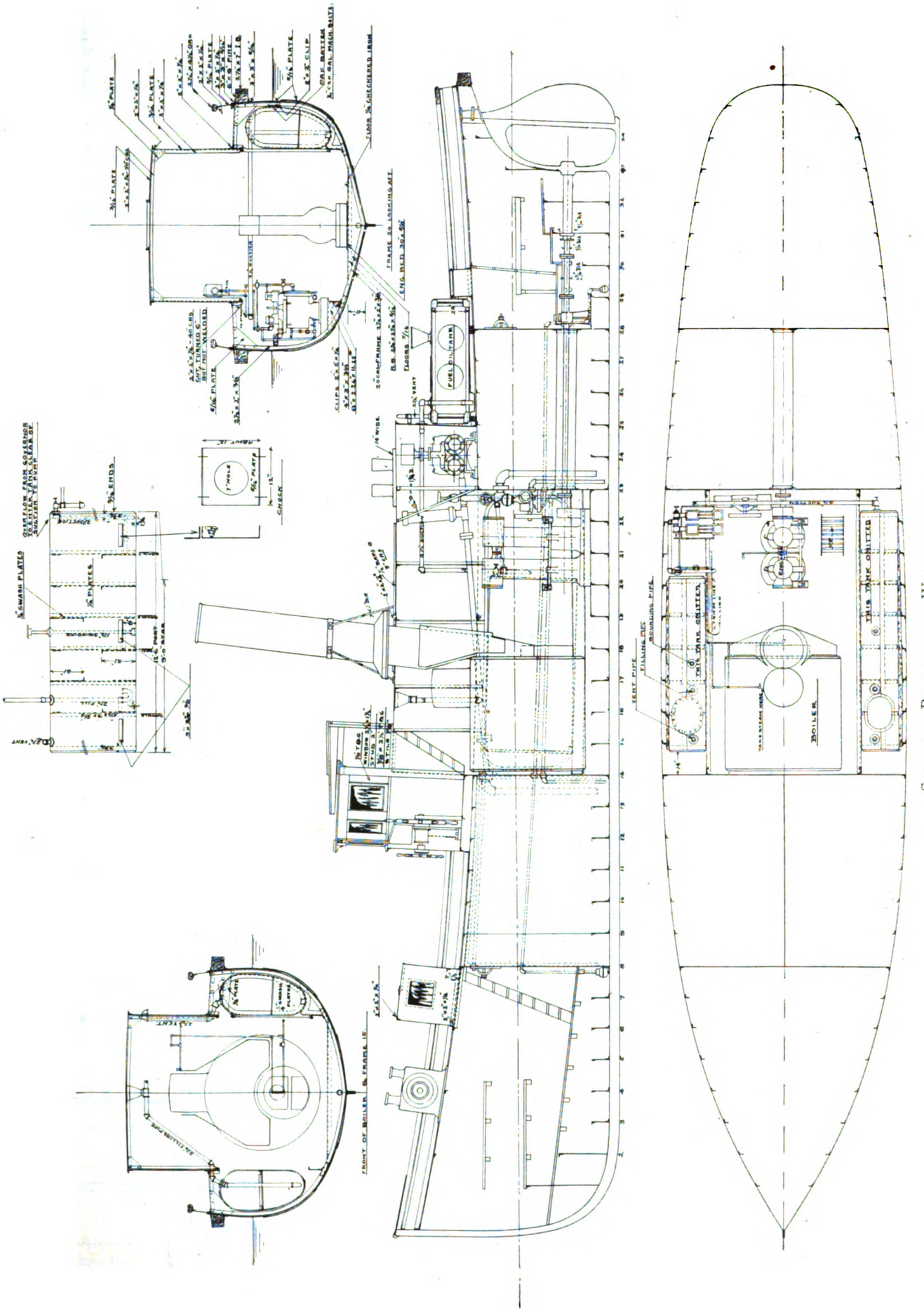
The Waternymph is an iron vessel, of 27 tons gross and 13 tons net, is 57.6 ft. in length B. P., 60 ft. 10 in. over all, 13 ft. beam and 6 ft. 2 in. depth of hold. She is fitted with a high pressure engine with two cylinders 8 in. diameter and 8-in. stroke, turning 150 revolutions per minute. She has a Scotch boiler 6 ft. in diameter and 6 ft. long with one furnace 30 in. in diameter and 4 ft. long. The boiler has a total heating surface of 314 sq. ft. and is allowed 125 lb. of steam.

In this vessel the boiler is located in the usual manner, with the bulkhead forward of the boiler room forming the after bulkhead of the water tank. The space between the engine and boiler is open.

It is proposed to install one fuel tank on the deck aft of the house. The old boiler has been condemned and a new boiler is being built by



PROFILE VIEW AND DECK PLAN OF WATER NYMPH.



SECTIONAL PLAN OF THE WATERNYMPH.

the Keystone Boiler Works. The fuel is to be atomized by steam, using the oil pumps, heater and burners of the Staples and Pfeiffer system. The fuel oil tank will be made of ¼-in. plate with oil tight riveting, built, secured and ventilated to the requirements of the United States inspectors.

The general scheme of burning oil, as shown by the plans, is that the oil is drawn from the tank through a steam cleaning strainer to the pump. After passing through the pump it is delivered to the heater, where the temperature is raised to about 175 degrees. From the heater the oil passes to the oil meter and from the meter to the burners. The excess oil which does not go to the burners is by-passed through a spring relief bleeder valve back to the tank.

The steam to run the pumps and the burners is drawn from the auxiliary connection on the boiler and the exhaust steam from the pumps, passes to the heater and the remaining heat units are used to heat the oil. There is another live steam connection to the burner for atomizing the oil.

The Waternymph is at present owned by Messrs. Harvey & Roberts, of San Francisco, and performs the same duty that she did when she was first built. It is interesting to note that Captain Harvey went to the vessel as chief officer when a boy and has been with her ever since.

Isherwood System of Framing for Small Vessels

By Robert Curr.

PLANS Nos. 1, 2, 3 and 4 show midship section, longitudinal framing, bow framing and deck plan of a vessel 70 ft. by 16 ft. by 7 ft. 9 in. As shown by midship section, the transverse is composed of a web or belt around the vessel on the inside, supporting the shell and deck. The transverse is 9

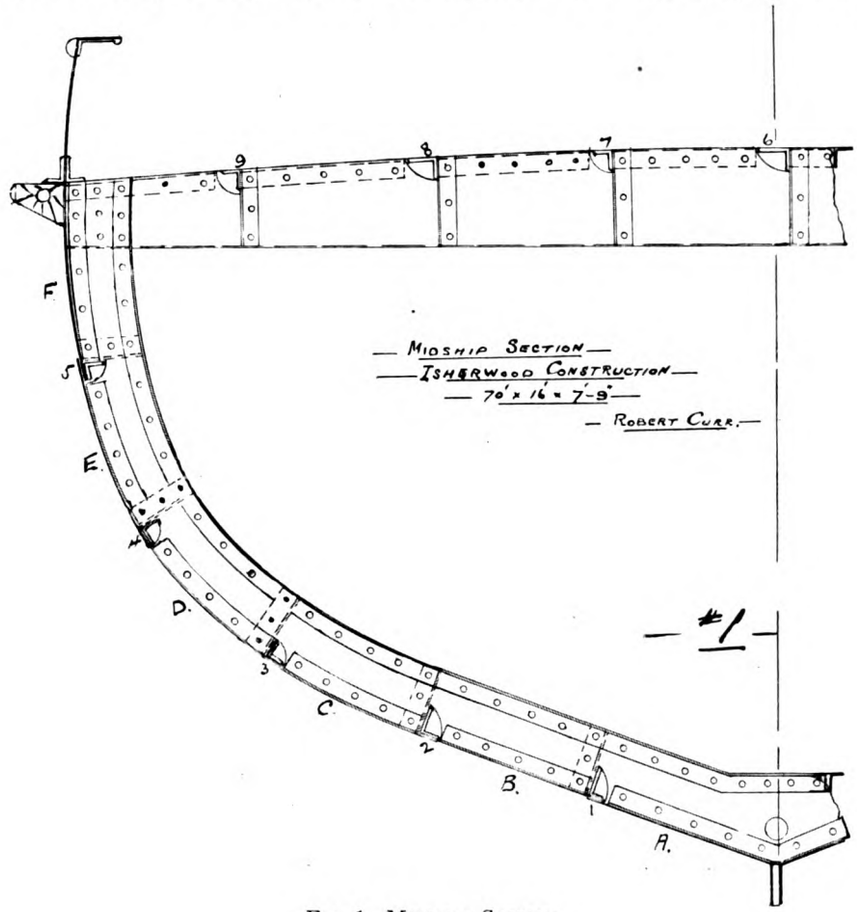


Fig. 1—Midship Section.

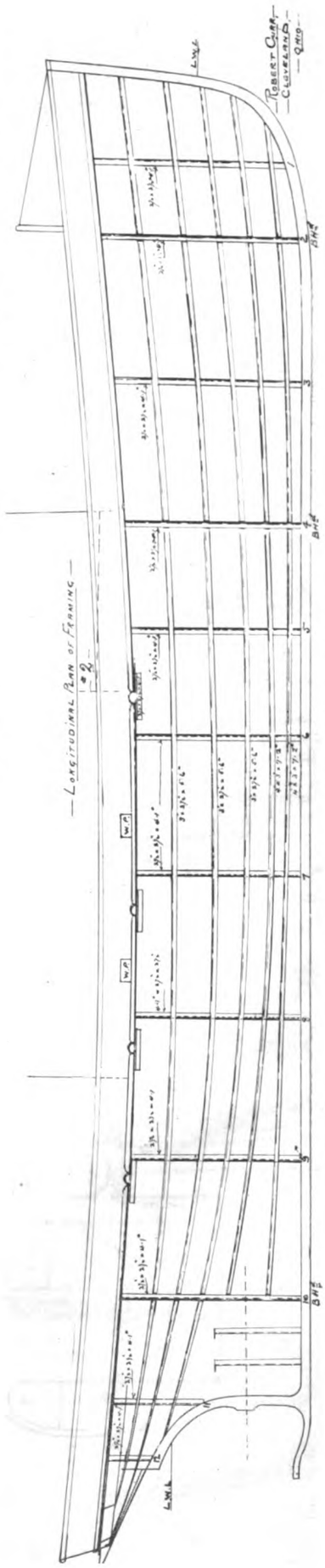


Fig. 2—Longitudinal Plan of Framing.

in. deep on the side and 13 in. at the center of the deck. The transverse is notched out for the longitudinal frames to pass through as shown by numbers 1 to 9. Clips are fitted at

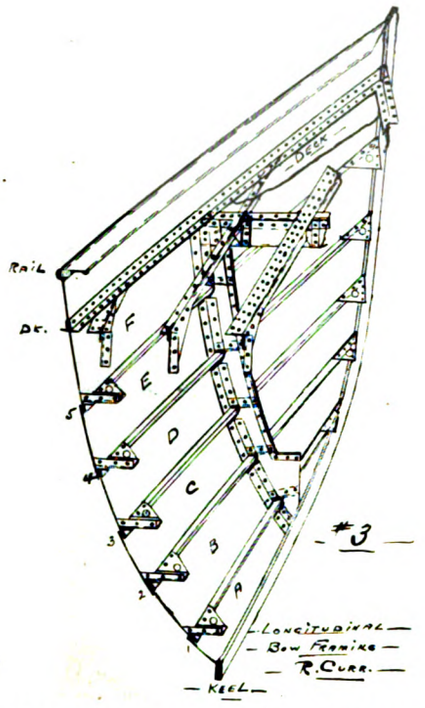


FIG. 3—LONGITUDINAL BOW FRAMING.

right angles to the plating, and the longitudinal frames are riveted to same.

The angles to shell and deck plating are fitted between the longitudinal frames, while the face angle is in one piece on each side of the vessel, butted at the middle line of vessel and connected with a back strap, forming a double angle on the floor.

Nine transverse and three bulkheads complete the cross bracing of this vessel.

Plan No. 2 shows the longitudinal framing of the vessel. The frames are five in number, and run from bulkhead to bulkhead. These frames are bracketed at the bulkheads as shown by the bow framing plan.

Bow plan No. 3 shows one side of the vessel with No. 2 bulkhead and part of the deck plating removed. The parts shown are stem, longitudinal frames with brackets to bulkhead and breast hooks. No. 1 transverse, deck longitudinal, stringer angle, fender angle and bulwarks.

The shell plating is the width between the longitudinal frames as shown on this plan and midship section by letters A to F.

A strake the garboard and sheer strake F are 10.2 lbs. per sq. ft. and balance of the plating 7.2 lbs.

Deck plan No. 4 is similar to any other vessel of this kind, excepting the longitudinal angles as shown on the midship section Nos. 6, 7, 8 and 9.

No. 9 angle is continuous but the others, 6, 7 and 8, run from the house to each end of the vessel. Angles No. 6 and and No. 8 are wider on the deck flange in order to form a butt strap for the deck plating.

These longitudinal angles are bracketed to the bulkheads the same as the longitudinal frames.

The bracketing of the longitudinals can be arranged to come on the vertical stiffeners on the bulkheads, which effects a saving in rivets.

The saving effected in a small vessel like this is in there being less transverse frames to heat and bend and the saving of rivets through the shell plating, likewise the liners required to fill out the outside strakes in way of the frames.

The laying out of the shell plating of a small vessel like this on the floor compared to the large vessel runs high in expense, not considering the time delayed in doing so.

The laying out of ribbands is necessary to get fair work.

The longitudinal frames overcomes the resorting to ribbands, for they can be laid out instead and when in place the vessel is ready for plating.

In an arrangement of this kind the only riveting required for the longitudinal frame is one rivet through the clip on the transverse.

The rivets in the shell flange of the longitudinal serve the purpose of the seam riveting, so that there are no extra riveting through the shell for longitudinal frames.

There is something like two tons of metal and 2,000 rivets less in a vessel of this construction compared to one of the same size with transverse framing. The frames being on the seams of the plates insures fairer edges and the outside plating may be all marked with the use of a butt mold and save the time in waiting for a shell plate being erected to secure a butt in order to continue the strakes of plating.

The work in fairing up the vessel is lessened by the Isherwood system, seeing there are so few transverses to contend with.

The real value in economy and dispatch can better be realized in building a vessel of this construction.

The Coastwise Transportation Co. has given contract to the New York Ship Building Co., Camden, N. J., for the construction of a collier, to be 370 ft. long, 50 ft. beam and 32 ft. deep.

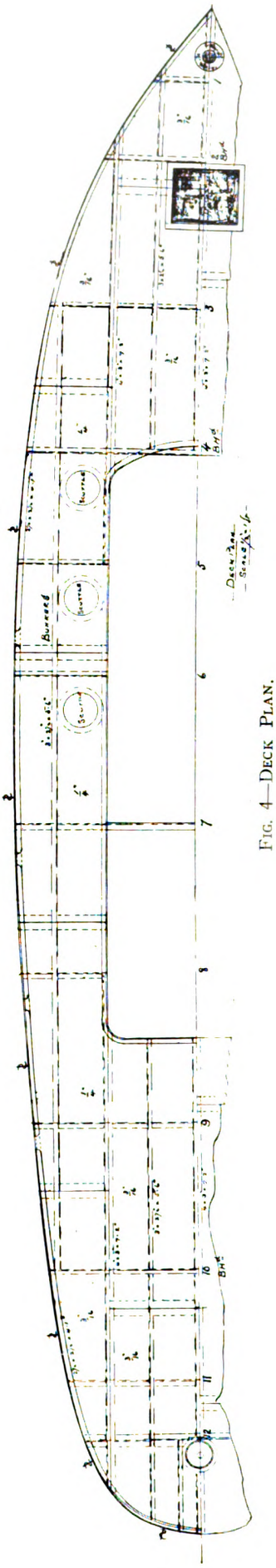


FIG. 4—DECK PLAN.

British Internal Combustion Engine Development

TO A Tyne firm, Messrs. Swan, Hunter & Wigham Richardson, Ltd., belongs the honor of being first among British ship builders to complete a cargo carrier of considerable size making use of the new propulsive agent. The vessel referred to, named the Toiler, is intended for service on the Canadian lakes, and is expected to arrive at Montreal early in this year's navigation season. She will probably be the strangest vessel that has ever been seen on the Canadian canals and lakes, being a big freighter—as big as will go through the locks—with neither masts nor funnels, but just a flat hulk. Its motive power is to be internal combustion oil engines. The chief reason for the adoption of the oil engines is the necessity for economizing weight and space, so as to allow the greatest possible amount of cargo within the limitations of the locks during the navigation season. The limit in reduction of weight was long ago reached, so that the only possible method of increasing efficiency was reducing the weight of the engines. It is stated that the introduction of oil engines has effected such a saving of space that the vessel will carry nearly 3,000 tons, or about 97,000 bushels of grain, an increase of about 15,000 bushels compared with the largest vessels fitted with steam engines and designed to pass through the locks connected with the great lakes. As a result of this success it is predicted by shipping experts that within a few years coal will be dropped for canal freighters and oil engines exclusively adopted.

The propelling machinery consists of two sets of oil engines, driving twin screws. The engines are directly connected, without clutches, to the propeller shafts, and are a modification of the Diesel type. There is no injection system of any kind. The starting and reversing gears are very simple and are operated by means of compressed air, the same power being also used to drive the steering engine and other auxiliaries. The fuel is crude petroleum, which is injected into the cylinder without being vaporized, and is ignited and burned in a charge of hot air. This air, when the oil is injected, is at a dull red heat, generated under very high compression. The Toiler will be the first gas or oil engined ship to cross the Atlantic under her own power.

As stated in the March issue, J. T. Eltringham & Co., South Shields, Newcastle-on-Tyne, launched, on Feb. 16, the first ocean-going gas-propelled vessel, which they are building to the order of the Holzapfel Marine Gas Power Syndicate, Ltd., and was named Holzapfel I. This vessel is 120 ft. long, 22 ft. beam and 11 ft. 6 in. deep, intended to run between Welsh and French ports, and to carry over 300 tons on a draught of 10 ft. It is highly probable that before long there will be a Holzapfel II, for it was stated at the launching ceremony that it was hoped to launch another vessel before the end of the year which would be six times as large as the present one, and, moreover, would be driven by gas power made from bituminous coal, such as is produced on the Tyneside.

Holzapfel I.

In the building of Holzapfel I it was necessary for the purpose of trim to have two hatches instead of one, as is usual in a vessel of this size. In order to conform to existing conditions the engines and gas plant were placed aft. They occupy about the same space as boilers and compound engines in vessels of similar size. Two generators, each of 100 h. p., are provided, and two vaporizers and scrubbers. The whole gas plant is raised on a gas-tight platform, 3 ft. 9 in. above the keel of the vessel, and enclosed by gas-tight bulkheads. The two producers stand side by side, and are each 3 ft. 6 in. square, their fronts forming part of the bulkhead. The vaporizers are at the back of the producers, the two scrubbers are about 13 ft. high and 2 ft. 6 in. diameter each, the upper portion being the wet portion. The cooling water and the circulating water for the engines are obtained from a tank fixed on the poop deck of the vessel and supplied by pumps which can be worked either by the main engine or by a separate paraffine engine. The cooling water, on passing from the scrubbers, flows into a tank placed directly underneath them, and is thence pumped overboard by a separate pump driven by the main engines. The cooling water for the cylinders flows overboard by gravitation. She has a donkey boiler, 5 ft. in diameter and 8 ft. 6 in. high, and two steam winches of two tons capacity each. The bunker is of 12 tons capacity and is situated in the 'tween decks. The estimated consumption is 28,000 lbs. of coal per 24 hours, and the speed is about 7½ knots. The engines have double ignition and give 180 B. H. P. at 450 R. P. M. A Fottinger transformer (an ingenious German patent), is fitted to gear down the revolutions to an economical speed, for the propeller.

The first cost of the gas power installation will be in excess of the Diesel installation, but the saving in the coal will much more compensate for this, while cost of maintenance will be considerably less than in the case of steam engines.

A. C. Holzapfel, speaking after the launch, said it would be realized that the steam engine and the steam turbine were not likely to be the motive power of ships in the almost immediate future, and that the internal combustion engine was bound to take their place on account of the many advantages which it was capable of bringing. When they spoke of the internal combustion engine for sea-going vessels, they had for economical reasons to consider only two types—the Diesel type of oil engine, consuming heavy residual oils, and the gas engine. They were at that moment at the parting of the ways. Ship builders, ship owners, and engineers would have to decide to which of these types they had best give their attention, for it was the type to which most attention was given, and which was backed up most by brains and money at this time, that would be universally adopted.

Looking Ahead.

In the course of further remarks Mr. Holzapfel observed that the residual oils required for internal combustion engines were not present in the American petroleum to so large an extent as in the Russian and East Asian oil, and for this reason, if the navy should adopt oil engines, it would be dependent for its supplies very largely upon Russia and the Far East. The Russian oils would have to come through the Dardanelles and Bosphorus, which, in case of a European war might easily be seized and blocked by a continental power. Eastern supplies would have to come through the Suez Canal, and the question whether this might be blocked in case of war had often been discussed and considered.

The Merchant Marine.

Coming to the merchant marine, Mr. Holzapfel observed that petroleum production was more or less under

the control of two powerful groups. If at any time they should amalgamate or form a trust woe betide ship owners who depended upon them for their supplies. The alternative road was that of the gas engine, the gas being produced frim coal, of which we had an unlimited supply in this country, and of which our colonies, Canada, South Africa, India and Australia, had also large and important supplies. At present the cost of driving a vessel by coal gas came out considerably cheaper than oil, but this advantage was partially out-weighed by other advantages possessed by oil-engines. A ship with oil engines could not be readily adapted for being driven by gas power, whereas a ship with gas engines could at comparatively small expense be adapted for using oil. The oil engine obtained from oil practically all heat energy possessed by the oil, while the gas engine so far obtained considerably less than half the heat energy contained in coal. The gas engine and gas power plant were, therefore, capable of enormous improvement, and he looked to marine engineers to do for gas what in the past they had done for steam.

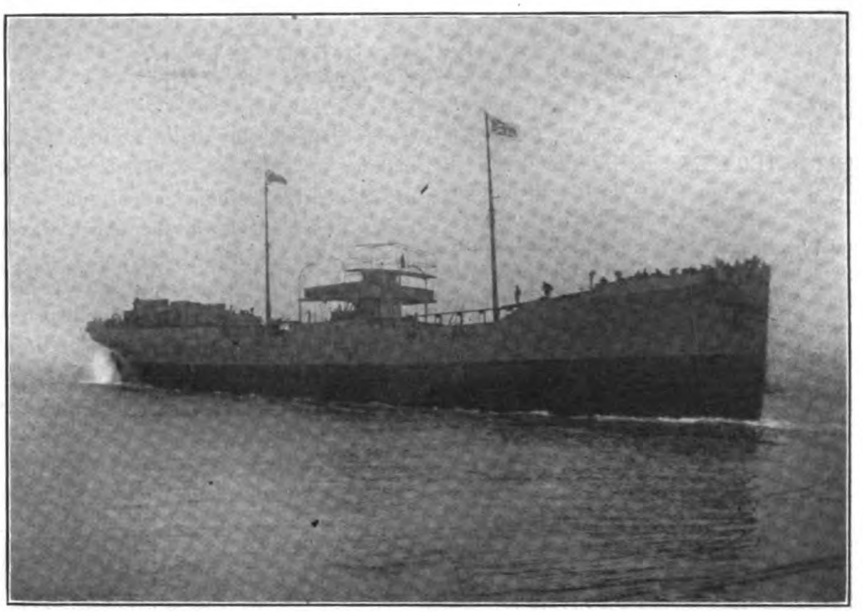
Oil Tanker for British Admiralty

The Greenock & Grangemuth Dockyard Co., Greenock, recently launched the Burma, the first oil tanker constructed by the British admiralty. She is intended for the purpose of supplying warships with oil at sea.

Some few years ago, when oil fuel was in its infancy, but when its possibilities were being advocated by far-seeing men, a well-known Liverpool engineer, dealing with the question of supplying fuel at sea, outlined the practicability of such a steamer as the Burma. He argued that it would be possible for a battleship to tow the vessel and draw its supplies from a coupled hose pipe.

At the time the suggestion met with a good deal of derision. Now we read that the Burma has many novelties, "the vessel being fitted out with the object of oiling the British fleet at sea. She is capable of towing a vessel and supplying her with oil fuel or being towed by the Dreadnoughts and supplying them with oil fuel at the same time; also so fitted that she can oil vessels alongside from four different positions situated on the port and starboard side of the vessel."

The vessel carries 2,500 tons of fuel in 12 tanks, each of these tanks having been subjected to a most searching and severe test by both the Admiralty and Lloyd's surveyors. All the tanks were passed at the first tests. Forward of the engine-room is situated the pump room, which contains two powerful oil pumps, capable of discharging 400 tons of oil per hour. A most complete system of oil pipes and valves has been installed, by means of which the control of the entire operation of taking in or discharging the cargo of oil can be performed by the operator in the pump room, the pumps acting separately or together. In the pump room there is also placed a powerful steam-driven fan for the purpose of exhausting from the tanks the heavy and dangerous vapors which remain there after the oil has been discharged, so that the crew may be able to clean the tanks with the utmost safety. The vessel is fitted with a complete installation of electric light and steam heating. A novel system of overhead trolley railways, situated in the 'tween decks, has been provided for the conveyance of coal at any time this is required with a minimum of labor from the 'tween decks to the stokehold. The vessel has been designed by the builders for an actual speed of 12 knots when at sea.



STEAMER BURMA, THE FIRST OIL TANKER BUILT FOR OILING THE FLEET AT SEA.

Fighting Fire with Carbon Dioxide Gas

With a view of eliminating the enormous losses by water to the cargoes of vessels incident to the extinguishing of conflagrations among the shipping along the water front, Fire Chief Thomas R. Murphy of the San Francisco fire department has recommended the use of carbon dioxide gas by the fire boats of the city. Murphy's plan is to have steel lighters built for service with each fire boat and equip them with large gas tanks and generators.

When the vessel is called into action by a fire among cargo the lighter will be pulled alongside and after the hatches have been battened down the gas will be pumped into the hold. The gas is twice as heavy as air and it is expected will force the latter from the hold extinguishing the fire.

"There are cargoes coming into this port the value of which is as high as $2,000,000," said Murphy recently. "In handling a fire that would actually do about $10,000 worth of damage we often destroy goods to the value of ten times that amount on account of the necessity of flooding the cargo. In using the gas the damage will be confined to the goods which actually come in contact with the flames and the balance of the cargo will be uninjured.

"I have been working with Prof. O'Neil of the University of California for the past year and we have succeeded in generating a carbon dioxide gas at little cost, which can be pumped into the hold of a vessel and will effectually extinguish the fiercest blaze with no damage to the balance of the cargo. We have worked with the least expensive method using limestone and sulphuric acid or water, marble dust and muriatic acid. Even in making large quantities of this dry gas the cost would be little and absolutely nothing when compared with

the value of the goods destroyed under the present method of fighting this class of fires.

"My plan and the one that I have recommended to the Fire Commission is the building of steel barges with tanks and cylinders containing the necessary ingredients to put out any fire. The barge would be tied up to the wharf with the other fire boats and would be towed to the vessel on fire.

"With the present system the fire boats are frequently out of service for other fires for three or four days at a time, while they are fighting a fire in the hold of a single vessel. With the new method the time needed to put out a blaze would amount to very little.

"The hold would simply be filled with the carbon dry gas and the fire would go out immediately or would remain in the bales of goods only as long as the oxygen that the material contained lasted."

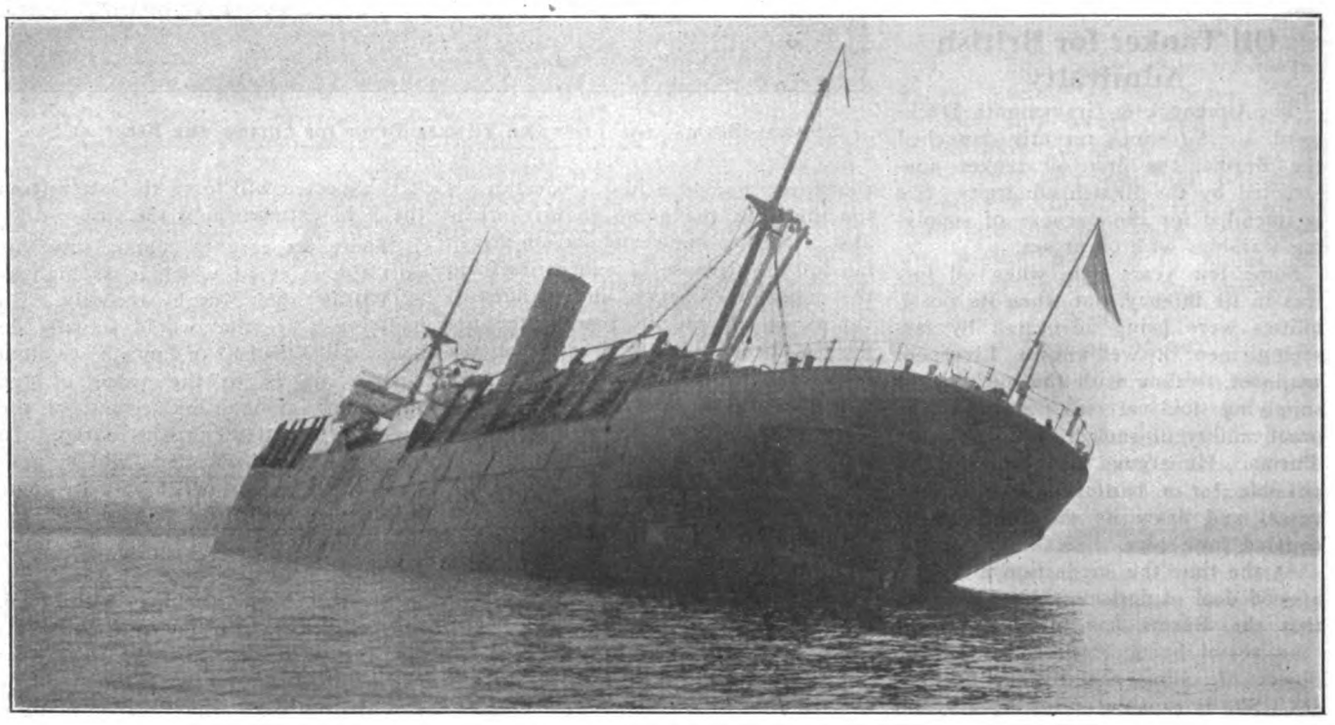
Cuzco's Rough Trip

Seattle, Feb. 82.

WHETHER it is the part of wisdom to lash the deck cargoes of lumber laden vessels leaving Pacific coast ports on offshore voyages so securely that the lashings will not give way under extraordinary strain is the question that is agitating surveyors, underwriters and masters at the present time. The query follows the experience of the Norwegian steamer Cuzco, owned by W. R. Grace & Co. and operated by this firm between Puget Sound and Peru and Chile.

On Feb. 12 the Cuzco was in one of the most terrific gales that has swept the north Pacific in years and that she did not founder is a tribute to the skill of her master, who managed to bring his vessel back to Port Townsend in safety, although she had been in extreme danger for many hours. Upon making port she had a list to starboard of 23 degrees, although at one time, while being tossed about on the angry waves at sea, she was heeled over at an angle of 35 degrees, threatening at any moment to turn turtle. The fact that the steering gear was jammed and parts of it carried away, rendering the vessel practically helpless, indicates what a close call the big freighter had.

During this harrowing experience the Cuzco's deck lashings held fast. The cargo consisted of 1,200 tons of flour stowed in No. 1 hold and No. 3 'tween decks and 2,800,000 ft. of lumber, about half of it on deck stowed to a height of 15 ft. When struck by an unusually heavy sea, which hit her broadside, the Cuzco's deck cargo shifted so that its outer line was 6 ft. beyond the bulwarks. With the exception of one small lashing aft, which broke and allowed between 15,000 and 20,000 ft. to go overboard, the cables about the deck cargo held fast. When the deckload went to starboard it jammed the steering gear, rendering the vessel helpless. Had it been possible the lashings would have been cut and the deckload jettisoned, but it was impossible to do so, for it meant death to any man who attempted such a foolhardy feat. The vessel refused to right herself as she would have done had she been able to relieve herself of the heavy load above deck. Consequently with steering gear crippled, the vessel got into the trough of the sea and wallowed helplessly for many hours. It was impossible to get her head up to the sea and she simply drifted about 20 miles to the north until off the entrance to the Straits of Juan de Fuca. By this time she was in smoother waters and by good navigation the master brought his vessel up the straits and finally made Port Townsend, the vessel still having a list of 23 deg., her starboard rail being well under water, which reached almost to the hatch combings. While at sea the Cuzco took a lot of water below decks as it poured through the hatches, whose covers had been torn off, and through the rivet holes in the deck, from which the rivets had been wrenched loose. However, the inflowing water was controlled and it failed to reach the fire room. Here it was necessary to extinguish the fires on the



NORWEGIAN STEAMSHIP CUZCO LISTED IN STORM ON THE NORTH PACIFIC, FEB. 12, LAST.

high side of the boilers, as the vessel's list caused the water to run to the starboard side of the boilers, leaving them dry to port.

Survey showed that the vessel's flour cargo had not been damaged and there was little loss on the lumber. The mainmast shrouds and stays on both sides were carried away, while the mast was bent. The shifting of the cargo damaged all the starboard bulwarks and rail, pulling the rivets of the stays out of the deck. Steering rod and chains also required replacing. Temporary repairs were made to the steamer by The Moran Co., of this city, which completed its work in four days, although under its contract, six days were allowed. When the vessel returns from her voyage to Panama and the west coast she will be docked for survey and permanent repairs made. It is expected that the vessel's damage and delay will mean a total expense of at least $20,000.

After the narrow escape of the Cuzco the question of too secure deck lashings is pertinent, for in many instances the parting of the deck cables has undoubtedly saved vessels from going to the bottom. In cases like the Cuzco, where it is impossible to cut the lashings, there is no question that the heavy deck cargo subjects a vessel to the greatest hazard, especially where the ship has a pronounced list, steering apparatus disabled, and is drifting in the trough of mountain high seas. On the Pacific coast, where unusually high deck loads of lumber are stowed, there is no question that the query of the security of lashings is one well worthy of expert attention.

Twin-Screw Passenger Steamer Gerona

ON SATURDAY, March 4, Messrs. Swan, Hunter & Wigham Richardson, Ltd., launched from their Wallsend ship yard, Wallsend-on-Tyne, the twin-screw passenger steamship Gerona, the latest addition to the Cairn Line Steamships, Ltd., of Newcastle-on-Tyne. This vessel embodies some of the features of the Tortona, recently built by Messrs. Swan, Hunter & Wigham Richardson for the same owners, but she is larger, has a great deal more passenger accommodation and in every way has been improved to meet the increasing requirements of the service between England, Canada and Italy. The Thomson Line, of Dundee, which is now incorporated with the Cairn line of steamships, used to own a vessel called the Gerona, remarkable for her popularity owing to immunity from accident and for her earning capacity. It has, therefore, been considered a good augury to revive the name in the new ship. Gerona, a cathedral city in the northeast of Spain, bears an illustrious name. It is the ancient Gerunda of Roman times, said to be the first resting place of St. Paul and St. James when they went to Spain. A strongly fortified place it was for many centuries the coveted possession of successive warlike hosts, whether Roman, Moorish, Spanish, Austrian or French. It has been besieged 25 times, but captured on only four occasions. The last and most famous siege was from May to December, 1809, when it was invested by 35,000 French troops, no less than 40 batteries of artillery being erected against it. The brave defenders capitulated only when worn out by famine and fever and after the French had lost 15,000 men.

Fine Service to Canada.

The addition of the Gerona to the Thomson line will enable a fortnightly passenger service to be maintained during the season of open navigation between the northeast coast of England, Southampton and Montreal, returning to London. The other vessels in the service will be the Tortona and the Cairnrona, which were also built at the Wallsend shipyard. In the winter and early spring these vessels will be employed in carrying emigrants between Italy and Canada. Passengers whether first class or emigrants will be able to enjoy all the comforts of ocean-going liners at fares about 20 per cent lower than those charged by other companies.

The Gerona is built to the classification of Lloyds, 100 A1, and she will comply with all the requirements of the board of trade, the United States laws for carrying passengers and the Italian emigration laws.

The vessel is rigged as a two-masted fore and aft schooner and has two funnels. There is a complete shelter deck from stem to stern and about it a poop, a long bridge and a topgallant forecastle. Deep web frames have been provided instead of hold beams, giving not only increased strength, but also leaving the holds clear for carrying bulky cargo, such as large machinery. Amidships there will be luxurious accommodation for about 140 first class passengers; the cabins will be spacious and comfortable, a certain number of them on the bridge deck being in sets of two with a communicating door to be used by family parties. The dining saloon extends right across the vessel and is surmounted by a handsome dome. On the deck above the dining saloon is the music room. At the after end of the deckhouse on the promenade deck is the smoke-room, abaft of which is a verandah cafe.

Throughout the vessel there will be ample provision of fire extinguishing pipes with a complete outfit of hose pipes.

Care of Passengers.

The electric installation will give lighting throughout the ship and also serve wireless telegraphy apparatus.

The planning of the catering department has been carefully studied, the galleys, bakeries, pantries and storerooms all being elaborated to comprise the most improved modern appliances. There are three separate galleys, for first class passengers, for emigrants and for the crew respectively.

On the shelter and in the upper 'tween decks there are berths for about 1,500 third class passengers, together with ample dining accommodation. All the sanitary fittings in the vessel are to pass the regulations of the board of trade and also the American and Italian emigration rules. There will also be hospitals for ordinary and infectious cases, an operating room and a dispensary.

A special feature of the emigrants' living quarters is a complete installation of the well-known thermo-tank ventilating and heating plant. The fans will be sufficient to renew the air eight times an hour. The fans can be reversed at will so as either to draw the air out of the different parts of the ship or to inject fresh air either cool or warm.

The captain, officers and engineers will have comfortable accommodation on the boat deck. The seamen and firemen, instead of having their living quarters in the forecastle, as is usual, will be more comfortably installed on the shelter deck at the after end of the vessel.

The twin screw triple expansion engines and also the boilers are be-

ing constructed by Palmers Shipbuilding & Iron Co., of Jarrow. The boilers will be worked with Howden's forced draught.

The Gerona has a large cargo capacity, an ample equipment of winches and derricks being provided to handle goods expeditiously. A considerable portion of cargoes from Canada will be food supplies and refrigerated holds will be provided for these.

PACIFIC COAST CASUALTIES

Seattle, March 15.

FOR several years the underwriters who have carried risks on Pacific Coast shipping have been heavy losers. It seemed as if 1910 had reached the maximum of sorrow for the insurance companies, especially those doing business on vessels plying the dangerous and poorly-lighted waters of Alaska. However, despite strong hopes that the worst was over, the new year has begun with a vengeance, and if the ratio of the first two months continues, the present year will go into history with as disastrous a record as has its several immediate predecessors.

Several heavy losses have already occurred this year. The most serious total loss thus far is that of the Skagway liner Cottage City, valued at about $100,000, which ran ashore at Cape Mudge, B. C., Jan. 26, and was left a total wreck on the rocks. Fortunately, this mishap was not attended by any fatalities as was that of the gas schooner Oshkosh, which turned turtle off the mouth of the Columbia River, Feb. 13, when six men lost their lives. The Oshkosh was valued at $25,000. The gas schooner Wilhelmina, valued at $20,000, is reported a total loss off the Umpqua River, Oregon. The tug Enola was burned on Puget sound recently, with a loss of $12,000.

The terrific gale of Feb. 12 resulted in a number of vessels being seriously crippled. The Norwegian steamer Cuzco limped back to port, with deck cargo shifted and the damage and delay mean a loss of $20,000. The four-masted schooner Willis A. Holden, with lumber from Tacoma for Callao, made San Francisco, with only her foremast standing and her deckload gone. The barkentine James Tuft and schooner Edward R. West were crippled in the same storm, both returning with canvas gone and leaking badly. The same gale damaged the steamer Daisy, which lost her deckload, while numerous other minor mishaps, due to the same storm, were reported.

Among the heavier casualties of the last two months is that of the steamer Queen, in whose cargo a fierce fire raged for many hours, doing damage estimated at close to $25,000. The fishing steamer New England and fishing steamer Chicago were both damaged in Alaskan waters, the former to the extent of $15,000 and the latter to the extent of $12,000. Steamer Victoria was twice ashore during her last voyage to Alaskan ports, and while survey has not yet determined the extent of her injuries, it will likely cost $25,000 to make repairs. Norwegian steamer Titania, with a cargo of coal from British Columbia for Mexico, ran ashore in Puget sound waters, when her steering gear carried away and repairs will cost about $30,000 in addition to salvage amounting to $6,800 already paid. American steamer Minnesota put into Yokohama with port propeller gone and shaft cracked, and underwent repairs in dock at Nagasaki. Steamer Coos Bay narrowly escaped total loss at Ventura, Cal., while British steamers Leebro and Tees were ashore and badly damaged on

STEAMER COTTAGE CITY, WRECKED AT CAPE MUDGE, B. C., ON JAN. 26, 1911.

Vancouver Island coast. Schooner Willie R. Hume, valued at $40,000, is reported a total loss off the Mexican coast. A collision between the steamers Meteor and Kingfisher in British Columbia waters did damage to both vessels amounting to close to $20,000.

Fire on Steamer Queen.

While Alaskan waters have been blamed and, to some extent justly, for the misfortunes of the underwriters who deal in Pacific risks, not all the casualties on this coast occur in the north. Just what the foreign companies will do in regard to Alaskan risks this year, is not yet known by local owners, but it is understood that in all Alaskan policies, the underwriters will insist on franchise or warranty of exemption to the amount of $2,500. This means that they will refuse to pay losses amounting to less than $2,500 and in claims greater than that amount, they will insist that the owners first deduct $2,500. This exemption would relieve the insurance companies of many small claims, but would fall hard on the owners. If the latter accept these terms, it is understood that the foreign companies will take Alaskan risks at the same rates as last season. During the recent session of congress, Pacific owners and others interested have been trying to impress upon congress how criminally Alaskan waters have been neglected as to the installation of lights and other aids to navigation.

Not All in Alaskan Waters.

While Alaskan waters exacted a heavy toll upon shipping during 1910, all of last year's heavy losses on the North Pacific did not take place in northern waters. In fact, the heaviest blow which underwriters suffered in the North Pacific in 1910 occurred just outside San Francisco on Nov. 22 when the Norwegian steamer Selja in heavy fog was rammed and sunk by the American coaster Beaver. The Selja was valued at $275,000, and her cargo at $400,000. This was a total loss. Another of the year's heaviest losses was not total, but it amounted to $400,000 damage to the cargo of the American-Hawaiian liner Alaskan, which put into San Diego in June with her cargo afire. This loss fell heavily on the underwriters. Another serious blow to the underwriters was the stranding in fog of the Canadian Pacific liner Princess May on Sentinel Island, Alaska, Aug. 5, and on this vessel the cost of salvage and repairs totalled about $115,000. Still another disaster which cost the insurance companies heavily occurred Oct. 8 in San Francisco harbor when the British tramp Damara ran ashore in a fog and was floated only with the greatest difficulty. This vessel was laden with a cargo of barley, of which 40 per cent was saved. The damage to the vessel amounted to nearly $200,000. The total insurance carried was $400,000, so that the loss to vessel and freight was fully covered.

This recital of the North Pacific's heaviest losses shows that not all the costly disasters took place in Alaskan waters, but still the poorly-lighted and dangerous shores of the north claimed a large amount of valuable shipping property during the year. Some of the heavy total losses in Alaska in 1910, included the following:

List of Casualties.

Steamer Farallon wrecked in Iliamna bay, Jan. 5; insured for $70,000; no salvage.

Steamer Yucatan beached in Mud bay after striking a submerged iceberg in Icy strait Feb. 16; salved after three months of difficult effort and towed to Victoria, B. C., at cost of $35,000; insurance on hull $174,000 and $75,000 on disbursements; hulk recently sold for $40,000, which sum, together with $160,000 cash, owners accepted in settlement after long controversy.

Codfishing schooner Stanley lost on Sanak Island March 29; loss about $20,000.

Whaling schooner Lizzie Sorenson struck by a whale and sunk May 12 off Cape Ommaney; probable value $25,000.

Power schooners Helen Johnson and Joe Matthews lost at Point Hope and Golovin, respectively.

Steamer Portland total loss near Katalla Nov. 12; valued at $55,000; insurance paid $41,500; cargo valued at $18,000 saved.

Steamer Olympia lost near Bligh Island, Dec. 11; insured at Lloyds for $155,000; thought to be a total loss, but yet undecided.

United States revenue cutter Perry total loss on St. Paul Island in fog July 30.

In addition to the above there have been several heavy bills footed by the underwriters following stranding and other mishaps. Besides the Princess May, already enumerated, some of the big repair jobs of the year have been:

Steamer Santa Clara struck Humbolt bar, damaged and waterlogged; repairs cost $56,000.

Steamer Georgia struck uncharted rock in Mud Bay, Alaska; salvage cost $2,000, repairs $3,000.

British steamer Tartar turned turtle at Lund, B. C.; cost of repairs and salvage $22,000.

Steamer Spokane stranded in Peril Straits, Alaska, in June; repairs cost $20,000.

Steamer Watson ashore on Waadah island, entrance to Straits of Juan de Fuca, September; repairs cost $22,862; cargo jettisoned valued at $30,000; heavy fog.

Steamer City of Puebla stranded in Puget Sound Sept. 19; cost of repairs $39,000; heavy fog.

Steamer Northwestern stranded on San Juan Island, Puget Sound, Dec. 2; cost of salvage $16,000; cost of repairs $45,000.

In addition to the above accidents, many of which were due to dense fog, which is frequently prevalent along the Pacific coast, there were other total losses. One of the heaviest was the sinking of the steamer Kitsap in Seattle harbor, Dec. 14 by the steamer Indianapolis. Fog was directly responsible for this. The Kitsap was a small local passenger vessel worth $45,000 and insured for 75 per cent of her value. At first it was thought she would be a total loss, but salvage efforts were finally successful. Other mishaps involving total losses in North Pacific waters during 1910 include the following:

British steamer St. Denis foundered off the Straits of Juan de Fuca Nov. 21 with all hands; insured at Lloyd's for $35,000.

Steamer Czarina lost on Coos Bay bar Jan. 12; valued at $75,000; 24 lives lost.

British barque Alexander Black total loss near Kahului, Hawaiian Islands, Jan 4, with cargo of nitrate insured for $120,000; hull valued at $30,000.

Schooner San Buenaventura abandoned off Oregon coast in January; total loss; valued with cargo at about $20,000.

Steamer J. Marhoffer burned to water's edge off Oregon coast, May 14; vessel valued at $80,000 and insured for $26,000.

Steamer Arthur B foundered off Fraser River, B. C., March 22, valued at about $10,000.

Schooner Eva wrecked at Altata, Mexico, April 2, worth about $20,000.

Fishing schooner Edith wrecked on Waadah Island, Straits of Fuca, May 8, valued at $10,000.

Schooner Dora Bluhm with cargo of lumber lost on Santa Rosa Island, Cal., May 25; total loss about $25,000; fog.

Schooner Annie E. Smale lost at Point Reyes, Cal., July 8 with cargo of coal; cargo insured; total loss about $25,000; fog.

Steamer Dode stranded at Marrow-

stone Point, Puget Sound, July 20; insured for $13,000 at Lloyd's.

Schooner James Rolph with cargo of coal total loss at Point San Pedro, Cal., Aug. 2; total loss $25,000; fog.

British barquentine Helga stranded in Hawaiian Islands Aug. 11; total loss with cargo of coal; total value about $30,000.

Tug Sea Prince rammed by British steamer Greystoke Castle in San Francisco harbor, Nov. 19; tug valued at $25,000.

Besides the serious and costly fire on the steamer Alaskan, fire has caused other heavy losses during the past 12 months. In fact, fire losses appear to have been unusually numerous during 1910. Among the vessels which have thus suffered and the estimated losses are the following:

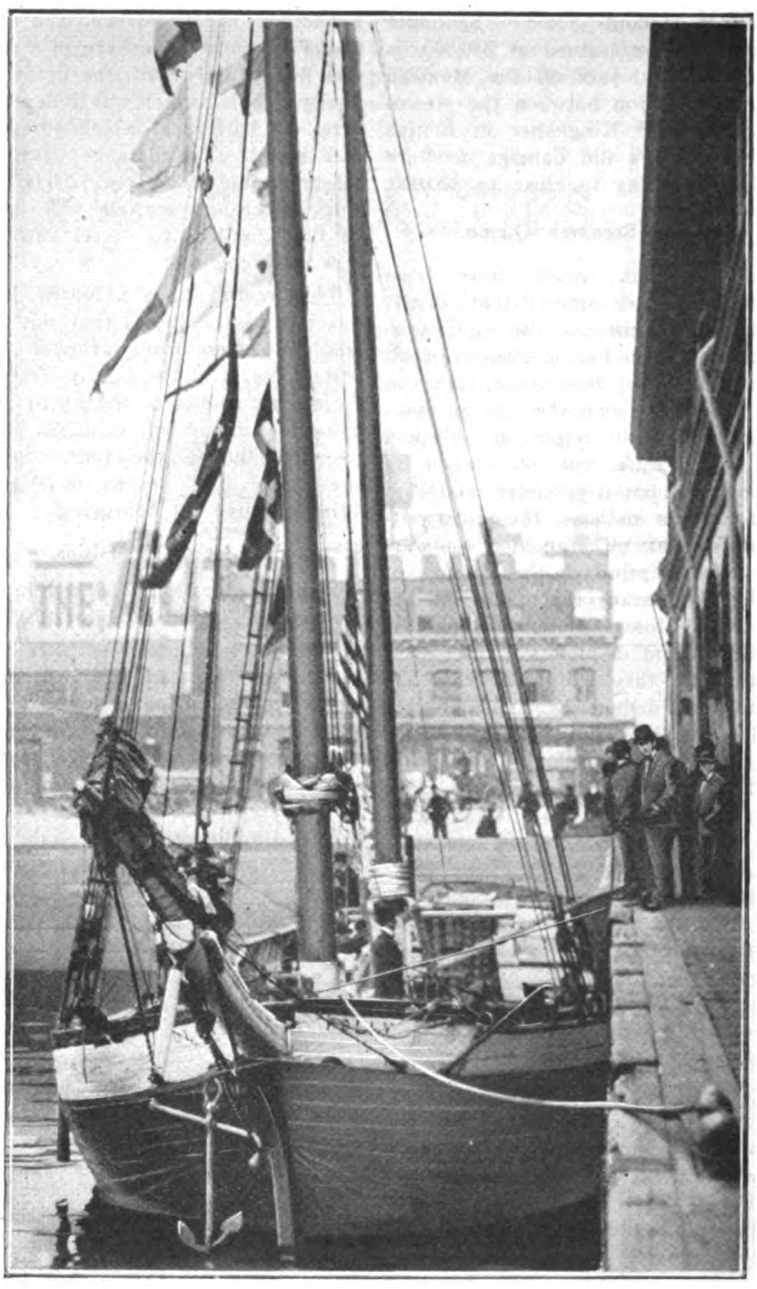
American ship Edward Sewall at Honolulu, Feb. 21, fire in coal cargo and vessel damaged; bark George Curtis, San Francisco April 4, nearly entire cargo destroyed, loss about $100,000; steamer Washington, Columbia river, loss $2,200; schooner Hugh Hogan, San Francisco, July 2, damage $6,000; steamer F. A. Kilburn, Oakland, Aug. 22, damage $50,000; coal barge Baroda, Esquimalt, Sept. 21, damage to coal $15,000, to vessel $10,000; steamer A. W. Sterrett, Tacoma, Sept. 26, salvage, and loss to cargo and hull $6,000; steamer Wildwood, Seattle, Sept. 19, total, $20,000; coal barge St. David, Seattle, Sept. 29, damage to coal and vessel $8,500; British steamer St. Nicholas at San Francisco after having fire in cargo at sea from June 23 to 28, in No. 2 hold; damage to cargo estimated at 20 per cent, vessel only slightly damaged.

Old Schooner Polly

The National Society of United States Daughters of the War of 1812 has recently presented an honorary tablet to the schooner Polly, a privateer of the War of 1812, and today, notwithstanding her age, a successful coaster.

The Polly is the oldest American vessel in commission, having been built in 1805. Though she has been buffeted by the seas for more than a century, the Polly is a staunch craft and frequently shows her heels to many of the more modern craft which she meets in the coasting trade between Calais and Boston. The Polly was fitted out as a privateer in 1812. After capturing several British merchant ships she was forced to lower her colors to the English frigate Phoebe, 44 guns and 217 men, the day before Christmas, in 1812. This ended her career as a privateer. The Polly rounded the Horn in 1849 with an adventurous party from Maine, and has since then sailed on all the seven seas. She has not missed a visit to Bar Harbor every August since the North Atlantic squadron has anchored there, and she is looked for as eagerly by the fleet as any belle in a ball-room.

This little 65-ton schooner is undoubtedly due for many more years of usefulness. She presents in her sturdy old age a worthy testimonial of the art of the old wooden ship builders of Massachusetts.



OLD SCHOONER POLLY

Passenger Boats with Internal Combustion Engines

One of the largest Russian shipping companies operating in the Caspian sea and on the river Volga, and trading under the title of Caucasus and Mercury, has just ordered five passenger boats fitted with internal combustion engines at a price of $165,000 each. Although the initial expenditure in replacing steamers by motor boats is considerable, the directors of the Caucasus and Mercury Co., so it is said, deem it perfectly justifiable, as in the long run it is sure to bring about a great saving on the cost of

fuel. It might be mentioned that the directors of the above company have distinguished themselves in the past as pioneers of industrial progress. They were first in Russia to foresee the possibilities of oil to liquid fuel for steam engines, and first began stoking steam boilers on their steamers with oil instead of coal or wood. Now they are taking a step forward in the direction of utilizing oil for navigation, which may be expected to meet with just as complete a success as their first step in that direction.

Some Practical Experience with Corrosion of Metals*

By Engineer Rear-Admiral John T. Corner, C. B.†

IT SHOULD be pointed out at the outset that in this paper the writer purposes to limit himself to chiefly giving instances of corrosion which have come under his notice whilst actively engaged as a marine engineer, and to detail some of the practical methods found to be efficacious in dealing with the same.

Some of the causes of corrosion of metals on shipboard are so obscure, and the origin so difficult to trace, that no satisfactory explanation is so far forthcoming. On the other hand, cases have occurred in which the causes operating to produce the effects are clearly recognized and easily dealt with.

The writer has had no personal experience of the trouble which took place through the corrosion of copper and its alloys in the old wooden ships, but that such corrosion did exist is within the knowledge of most of those who have studied the record of such ships. Cases are mentioned of copper sheathing having become corroded in mysterious ways and at unexpected times, and there are reports of the heads of the nails having corroded entirely off, allowing the sheathing to become detached.

There were doubtless at times troubles through corrosion in the bilge and other copper pipes of the old wooden steamships of war, but as a rule these appear to have been of minor importance; and in many ships the chief anxiety the engineers had concerning the pipes was to keep them in a bright and burnished condition so as to pass the captain's weekly inspection, at which the array of copper piping in the bilges was often one of the show sights of the ship.

With the introduction of iron for ship building purposes the conditions were different, for it was soon found necessary to insulate as well as protect the copper pipes in or near the bilges—not, however, for their own welfare so much as for the sake of the adjacent plates and angles, which, when not so treated, were found to be adversely affected by contact, owing to the galvanic action set up between the metal pipes and the iron plating by the bilge water.

The Introduction of Iron.

There are many instances in which very considerable trouble was caused. Among them may be mentioned the case of the troopship Megaera, which vessel had to be beached at St. Paul's Island, about 1869, to prevent her sinking. It came out in the subsequent inquiry that among other defects in this ship, there was a serious one due to a copper strainer fitted to a bilge suction pipe in a remote part of the ship. The action set up by it was sufficient to eat right through the plates and so admit water to such an extent that the ship had to be run ashore to save her crew.

As far as can be ascertained, the pipes themselves in iron ships were no more affected than those in wooden ships, probably not so much; and it was not until at or about the time of a great change in the internal economy of men-at-war that serious and persistent trouble through the corrosion of copper pipes began to be manifest and felt. This change was the introduction of the electric light on shipboard.

Corrosion of Copper Pipes.

The writer's first experience of the insidious corrosion of copper pipes occurred in a ship which had recently been fitted with an electrical installation for working searchlights. During a commission of over three years, there were, as far as can be remembered, only two pipes which seriously suffered from corrosion; both were water pipes, and both were eaten right through in small holes which had the appearance of having been punched, and it is noteworthy that each of these pipes was in the immediate vicinity of an electric lead to a searchlight—the one forward and the other aft. The whole business was after all but a minor affair, and consequently very little notice was taken of it; it was only years afterwards when trying to assign a cause for similar trouble in various other ships that the previous experience was recalled to throw light on an obscure question.

There is no doubt whatever that the time of the introduction of the electric light in naval ships synchronized with a considerable increase in the corrosion of the copper and metal pipes and fittings; and as the parts affected were chiefly water fittings, the increased steam pressures which came at or near this period, and which might have been suspected as one of the causes, can be now quite absolved from any share or part of the trouble.

Sometimes pipes would be found eaten nearly, and in some quite, through in a very short period; moreover, the replaced parts often became similarly affected even when different brands or qualities of copper or brass were used. Sometimes the pipes were eaten in holes having sharp, clean-cut edges, as though punched; sometimes parts were pitted and honeycombed over a considerable area of surface; while in other examples the metal was nibbled out in such a way as almost to suggest the presence of rodents or microbes.

Speculation as to Source.

As regards the source of this trouble, some engineers for the reasons above stated were inclined to attribute it to electrical action due to the leakage from the mains, which was often so great as to allow electricity to permeate the whole ship. It must be admitted now that some of the earlier electrical installations on shipboard were a long way from perfect, inasmuch as leakage in some cases was sufficient to turn the ships into storage batteries. Others attributed these defects in the copper pipes to induced currents set up in different parts of the ship by the currents in the electrical mains. But nothing definite could be proved, and those then dealing with the electrical plant disclaimed all responsibility for the trouble, and, in fact, sometimes expressing the

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†Late chief engineer of Portsmouth dock yard.

opinion that the currents they used could hurt nothing and cause trouble to nobody.

It was also further suggested that the action might be due to mere chemical causes, but here again the responsibility for this was disclaimed by those concerned, the corrosion being put down by them to mechanical rather than chemical action; and there was certainly some ground for the contention, seeing that corrosion in pipes generally occurred at or near bends or barnches; also very extensive corrosion often occurred on the bronze propeller blades, especially at the forward side where there was little likelihood of extensive action, electrical or chemical, but abundance of the mechanical kind.

Chemical Action Induced by Galvanic Action.

It is very probable that a certain amount of chemical action was first induced by galvanic action, and the erosion caused by the friction of the water, which washed away the results of the chemical action, left the clean surface exposed to further and similar action. This explanation, however, would not fully apply to cases where clean-cut holes were found in the pipes, condenser tubes, etc.; these results were probably due to want of homogeneity in the composition of the metal, the galvanic and chemical action finding out the weakest places. It would also appear that the presence of air and moisture together largely influences the extent of the corrosion of these metals as of iron, and in a measure helps to explain the pitting on the forward sides of the propeller blades, where the partial vacuum formed by the motion of the screws causes air to be drawn from the surrounding sea water, which assists the corrosive action.

It was also suggested that the corrosion might be due to the use of copper of too pure a quality; and in this connection it may be noted that some locomotive engineers specify for about ½ per cent of arsenic in the copper firebox plates, as a preventive against corrosion. So there really may have been something in this suggestion, seeing that pure electrolytic copper was beginning to be used at or about the time referred to.

How to Cure the Complaint.

But whatever may have been the causes, the pressing business of the day was to discover the cure of the complaint; the prevention of the corrosion which affected most of the water pipes, including the condenser tubes of many ships, was what all aimed at. As regards the latter, it is understood there was not much general corrosion of the tubes in iron condensers. No doubt there have been, as there still are, some instances in which the tubes of iron condensers have given considerable trouble through various causes, some of which were foul circulating water, defective materials, excessive vibration through indirect local pressure, such as the direct impinging of the steam or circulating water on the tubes, etc.; but as regards the corrosion under consideration, it may be stated generally that it is certainly much less in condensers with iron shells than in those with brass shells.

One special case of an iron condenser which came under the writer's notice was interesting and unique, and may be mentioned here:—A ship with a cast iron condenser, with circulating water outside the tubes, had been running for several years with a set of tubes which had given no trouble whatever. The ship unfortunately got ashore on a sandbank, and in getting off stirred up the sand so much as to get a large quantity deposited in the condenser on the circulating sides. On returning to port for overhaul and repairs, the tubes were taken out to get rid of the sand. This afforded the opportunity for examining and attending to the inside of the condenser shells. They were cleaned by being chipped and scraped, and finally given a good coating of red lead paint. Shortly after the ship resumed service, the condenser tubes, which up to then had given no trouble, began to go to such an extent that the ship had to be again laid up for the complete re-tubing of the condensers. When this was done, the red lead paint was all removed, after which no further trouble with the tubes was experienced. This result clearly showed that the brass tubes were being protected when the iron shells were bare, but when covered with lead paint a corrosive action on the tubes manifested itself.

What One Engineer Did.

Another case of the protection afforded by iron may be mentioned:—In a certain ship, one particular pipe conveying circulating water was repeatedly in trouble through corrosion. This pipe would be found badly eaten away at a bend. It was taken down, patched and replaced time after time, but the corrosion still went on and continued. The chief enginer then resorted to the following expedient. He sweated a lump of copper on the outside of the pipe, so as to provide material for a screwed hole, through which a large iron bolt, about 1½ in. diameter, was fitted so that the point protruded; and no further trouble was experienced with this pipe, the bolt being screwed further in as the point became eaten away, and being entirely renewed when necessary.

These two examples appear to indicate that the presence of sufficient bare or unprotected iron in perfect metallic contact with the system strongly counteracts the corrosion of the copper or brass; the chemical or electrical or mechanical action, whichever it may be, solely or jointly, being entirely expended on the iron. It is, therefore, by the free use of iron or steel that it is considered the best protection of the copper or alloy pipes is provided.

Before resorting, however, to such free use of iron, various other means were tried in different ships. One method was to coat the inside of the pipes with marine glue, another to use plumbers' solder or tinman's solder as an internal coating. Special alloys containing aluminum were tried. Zinc slabs and blocks were used, as also zinc bars let in amongst the condenser tubes; and though some of these expedients effected a certain amount of good, it is considered that the present practice has more to recommend it than any of them, and that is the insertion of short iron lengths of pipe in runs of water pipes which can be easily removed and replaced; and further, the use of iron or steel doors for brass condensers with iron rods and plates in and about the tubes is very effective as a protection to the tubes and plates.

Iron Better Than Zinc.

In some warships of late years the condenser barrels are made of steel. Of course in this latter case there is the possibility of a certain amount of corrosion in the condensers themselves, but as this is only to be expected on the waterside, it should not be difficult to deal with—the design of the condenser being such as to admit of the easy replacement of parts likely to be affected, and provision being made for zinc protectors as in boilers.

It is considered more than probable that the reason why iron is found on the whole to be more efficient as a protective than zinc, is that with the former better metallic contact is assured and maintained, and perfect me-

tallic contact is undoubtedly an absolute necessity.

Respecting the corrosion on propeller blades, it is not known to the writer whether iron has been tried as a protection against corrosion; but he would suggest for consideration that if easily renewable plugs of iron could be put at the parts of the propeller blades where corrosion is likely to occur, they might lead to a marked difference in the extent of the pitting, for it may possibly be found that so long as there is iron in the immediate vicinity sufficient to absorb the corrosive action, the bronze will be entirely protected.

Tending Toward Greater Ships

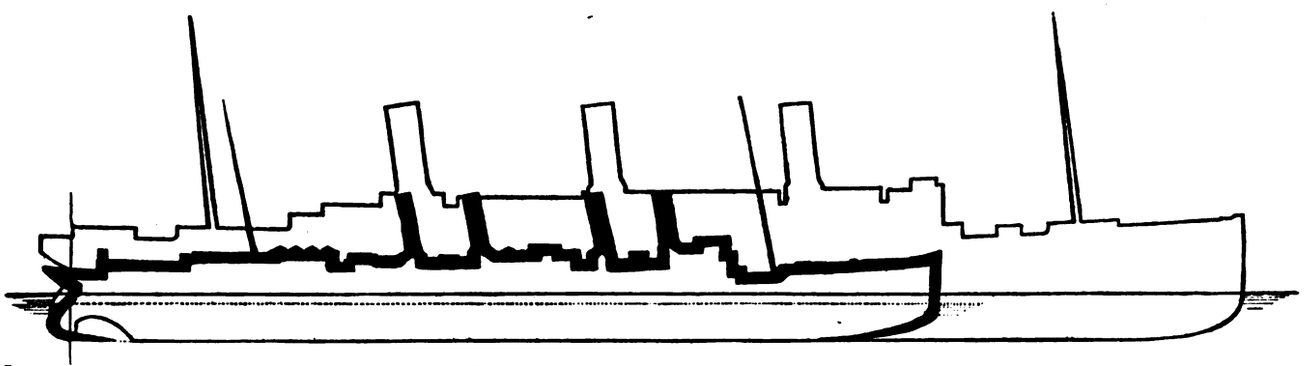
As illustrating the tendency towards larger and slower ships, the Cunard Line recently invited tenders from John Brown & Co., of Clydebank, and Swan Hunter & Wigham Richardson of Newcastle-on-Tyne, the builders respectively of the Lusitania and Mauretania, for the construction of the largest passenger vessel in the world for New York-Liverpool service, exceeding even the Olympic of the White Star Line.

The new Cunarder will be 885 ft. long by 95 ft. 6 in. broad, with gross tonnage of 50,000 and a speed of 23 knots. She will be propelled by turbines operating quadruple screws, and will outwardly resemble the Cunard flyers Lusitania and Mauretania, having four funnels and two foremasts. As further indicating the tendency rapidly growing in Great Britain, especially among the admiralty, her double bottom will be so arranged that she may carry oil fuel, should the installation of oil burners seem at some later date to be desirable.

In elaborateness of accommodation she will exceed anything yet projected, having a printing establishment for the issue of a daily paper and a theater in which plays and operas will be produced. She will carry a total of 3,790 passengers as compared with 2,500 on the Olympic and Titanic, and 2,200 in the Mauretania and Lusitania.

Since the Cunard Line has announced the projection of this new liner, the Hamburg-American Line has given out some interesting figures concerning the giant liner which it is now building at the Vulcan yard at Stettin. The gross tonnage of this new German liner will be equal to that of the proposed Cunarder, though she will be 4 ft. shorter. Her beam, however, will be somewhat greater. The flag at her mast head will be 208 ft. above the water.

Only 10 years have elapsed since the Deutschland, a vessel which created an enormous sensation at the time, was put in commission, but the hull of the new liner is so preponderant that the Deutschland could float within it as in a basin, even her funnels being hidden, as the accompanying line drawing will show. The Deutschland is only 662 ft. in length and her gross tonnage is only 16,500.



LONGITUDINAL SECTION OF THE NEW GIANT STEAMER OF THE HAMBURG-AMERICAN LINE COMPARED WITH THE LONGITUDINAL SECTION OF THE EXPRESS STEAMER DEUTSCHLAND.

These great liners represent the great advance which has been made in naval architecture during the past decade and moreover indicate that the latest tendency is not towards speed but greater comfort and greater luxury.

Advance Report on Lake Levels

The International Waterways Commission has reported adversely upon the proposition of locating a dam at the outlet of Lake Erie with a view to regulating and raising the level of the lower lakes. The board of engineers on deep waterways, in its report dated June 30, 1900, proposed a definite plan with estimates of cost for regulating the level of Lake Erie. The International Waterways Commission was therefore appointed to jointly consider the subject with the government of Breat Britain.

The plan proposed by the board consists of a submerged weir in connection with a set of sluice gates so designed that with the sluice gates all closed, the low water flow of the regulated stage of the lake will be discharged over the fixed submerged weir, and with the sluice gates all open, the additional volume of overflow necessary to maintain the lake at nearly the same level will pass through the sluices at times when the lake is receiving its maximum supply. They were to be placed near the angle in the Bird Island pier at the head of Niagara river and were designed to hold the level of the lake at or near 574.5 old levels, or 574.7 1903 levels, above mean tide at New York. This is higher than any monthly mean stage reached since authentic records have been kept, that is, since 1860.

The great lakes constitute a series of enormous natural reservoirs, each of which serves to regulate the flow in the river constituting its outlet and to maintain the lake below. They are inter-dependent. The study of one to be complete must include the study of all. The total area drained by them is about 287,688 sq. miles, an area considerably larger than the German empire. Of this total about one-third is occupied by the lakes themselves, that is, as devoted to river purposes. The result is a uniformity of level and uniformity of flow which is truly wonderful. No work of man ever has approached or ever will approach this perfection of regulation. The commission had an enormous volume of data available on water level observations, including all changes made in cross section of outlet, such as piers and approaches in the bed of St. Mary's river, the power canals at the

Sault and the drainage canal at Chicago.

It was found that the maximum stage of one lake does not occur at the same time as that of another lake, and this is true also of the minimum stage. Nor does the maximum outflow occur at the time of the maximum total supply or the minimum outflow at the time of the minimum total supply. The lake may continue to fall while the supply of water is increasing and vice versa. These great forces require time to act. The time required for an increasing supply to show its effect upon the level of Lake Superior is about 98 days, and for a decreasing supply it is about 91 days; in Lake Erie the corresponding influences are 76 days and 132 days respectively.

The commission concludes that in it is possible to regulate the level of Lake Erie, it is not altogether wise. The advantages of regulating Lake Erie between the limits 572 and 574.5 are that the low water stages of Lake Erie will be lessened about 1 ft; that of Lake St. Clair will be lessened 0.61 ft.; and that of Lakes Michigan-Huron about 0.27 ft., without in any case increasing the high water stage. The disadvantages are that the oscillations in Lake Ontario are increased by about 5½ in. and low water is made lower by about 4½ in.; that the depth in the St. Lawrence canals will be diminished by about 7.66 in.; that the city of Buffalo and its southerly suburbs will suffer by increased damage of floods and from a postponement of the date of opening of navigation in the spring.

The commission concludes that while its opinion the advantages are not of such an overwhelming character as to justify the two governments entering upon such a vexatious question. The commission says that it does not follow that nothing can advantageouly be done to improve or maintain the level of the lake may be raised sufraise the level of any lake by simply reducing the size of the outlet. With a reduced cross section the outlet requires a steeper slope and the average level of the lake is raised, but the oscillations will go on as before and the discharge will remain the same. To raise the level of Lake Erie will raise also, but to a less degree, the levels of Lake St. Clair and of Michigan-Huron, and thus will benefit those waters while it will have no effect upon Lake Ontario or the St. Lawrence river. It is believed that somewhere in the Niagara river between Lake Erie and the falls a submerged dam may be placed which will greatly benefit the navigation of the waters above without injury to those below, and with only minor damages, if any, to the adjoining lands. Without any attempt to regulate Lake Erie, the level of Lake Erie. It is possible to ficiently to compensate for the damage heretofore inflicted by the Chicago drainage canal and other deteriorating influences. To distinguish works of this kind from those designed to regulate the lake, they may be called compensating works.

The World's Ship Building

DURING 1910, exclusive of warships, 500 vessels of 1,143,169 tons were launched in the United Kingdom, of which 473 were steamers of 1,137,738 tons, and 27 sailing vessels of 5,431 tons. The warships launched at both government and private yards amount to 45 of 134,645 tons displacement. The output of mercantile tonnage in the United Kingdom during 1910 shows an increase of 152,103 tons over that of 1909, though with the exception of the years 1908 and 1909 it is the lowest recorded in thirteen years. Practically the whole of the tonnage launched has been built of steel and over 99½ per cent is composed of steam tonnage. Subtracting wastage the net gain to the tonnage of the United Kingdom is about 106,000 tons.

The number of large vessels launched in the United Kingdom during 1910 has been more than the average of recent years, the returns showing that 36 vessels of 6,000 tons and over were launched. They include the largest vessel ever built, the Olympic of 45,000 tons, and seven other vessels of over 10,000 tons each as follows:

	Gross tons.
Franconia	18,600
Edinburgh Castle	13,326
Maloja	12,800
Rotorua	11,130
Themistocles	10,925
Aeneas	10,049
Ascanius	10,048

At the present time there are under construction 46 vessels of 6,000 tons and upwards.

The average tonnage of steamers launched in the United Kingdom during 1910 is 2,411 tons; but if steamers of less than 500 tons be excluded the average of the remaining steamers reaches 3,623 tons gross.

Of the vessels launched in the United Kingdom 17 are capable of a speed of 17 knots and above. The fastest of these vessels are the steamship Olympic and three turbine steamers intended for Channel service, all designed for a speed of over 20 knots.

Output of Leading Ports.

The Glasgow district occupies the first place among the ship building centers of the country, showing an output of 211,076 tons. Then follow in order Newcastle (203,831 tons), Sunderland (179,435 tons), Belfast (163,336 tons), Greenock (122,722 tons), Middlesbro' (108,754 tons), and Hartlepool (86,295 tons). In war ship tonnage Newcastle leads with 28,515 tons, followed by Devonport with 26,350 tons, Portsmouth 22,500 tons. Glasgow 22,370 tons, and Greenock 20,000 tons.

Turbine Vessels.

Four vessels in which the turbine method of propulsion has been adopted were launched in the United Kingdom during 1910. Their names are as follow:

	Gross tons.
Angora	4,060
St. Petersburg	2,448
Caesarea	1,499
Sarnia	1,480

There were also launched the Olympic, 45,000 tons, and the Rotorua, 11,130 tons, both of which vessels are to be fitted with turbines as well as reciprocating engines.

Besides the above, at the end of 1910 there were under construction in the United Kingdom one merchant vessel of about 1,750 tons which is to be fitted with steam turbines, and four large vessels which will have turbines as well as reciprocating engines.

Other Special Types.

Of steamers building on the longitudinal framing system, eighteen were launched during 1910, with a gross total tonnage of 68,015 tons. The returns also include six vessels of the wing and side tanks type.

United States.

The total mercantile tonnage reported from the United States (331,318 tons), is about 122,000 tons larger than that of the previous year; the increase in the tonnage built on the coast amounting to 97,000 tons. These figures include, however, nearly 40,000 tons of vessels which are only intended for river and harbor purposes, etc. The figures for the Great Lakes are about 24,000 tons more than in 1909, and they include 20 steamers of over 5,000 tons each, the largest of which

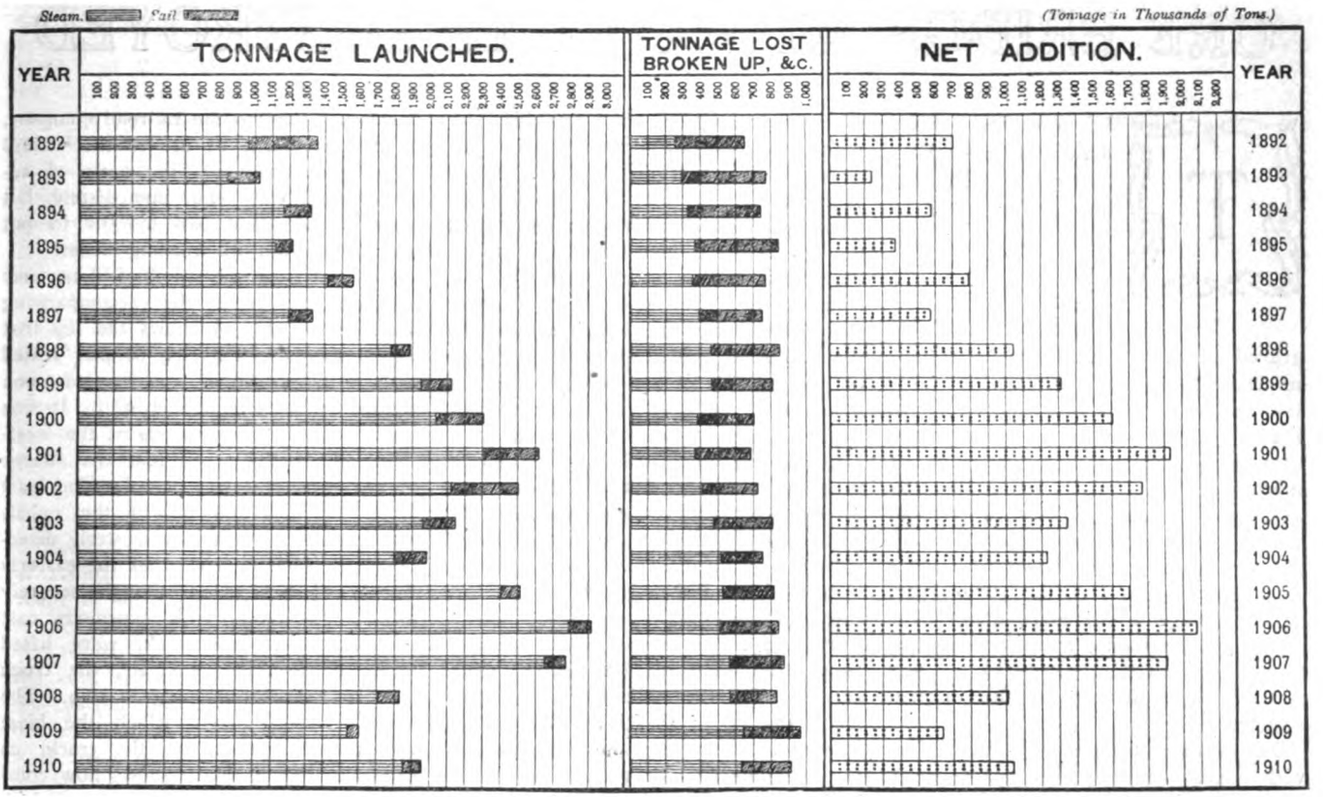


CHART SHOWING THE GROSS MERCANTILE TONNAGE LAUNCHED IN THE WORLD, AND THE GROSS MERCANTILE TONNAGE LOST, BROKEN UP, ETC., DISTINGUISHING STEAM FROM SAIL; ALSO THE NET ADDITION TO THE WORLD'S GROSS TONNAGE FOR EACH YEAR FROM 1892 TO 1910.

was the William P. Palmer of 7,602 tons, built on the longitudinal framing system by the Great Lakes Engineering Works, of Detroit, Mich.

The largest seagoing steamer launched was the United States Navy collier Cyclops of 10,644 tons, built at Philadelphia. Besides this vessel, there were launched 9 seagoing merchant steamers of over 5,000 tons each.

Only one sailing vessel of over 1,000 tons was launched during 1910.

Germany.

The returns show an increase of about 31,000 tons in the ship building output as compared with last year, but the figures (159,303 tons) are still about 159,000 tons less than the total built in 1906, which was the highest on record. As usual, the figures do not take into account vessels launched on the upper rivers, the total of which amounts to about 17,000 tons.

Nine steamers of 5,000 tons and upwards were launched in the country during 1910, the largest being about 8,000 tons.

No sailing vessel of any importance was launched during the year, but it is of interest to note that there are at the present time under construction at Hamburg two steel sailing vessels, each of about 3,000 tons.

France.

The present returns (80,751 tons) show an increase of over 38,000 tons as compared with the tonnage launched during 1909, and taken in conjunction with the fact that the tonnage under construction at the present time is nearly double that building twelve months ago, point to an upward movement in the French ship building industry.

The largest steamers launched during the year were the transatlantic liner France, of about 23,000 tons, building at St. Nazaire, to be fitted with turbines—the largest vessel yet built in the country—and the Sant Anna, of 9,350 tons, built at La Seyne. No other steamer of over 5,000 tons was launched during 1910.

Holland.

The total tonnage (70,945 tons) launched in Holland during the past year exceeds by nearly 12,000 tons the figures for 1909. This total does not include vessels known to be exclusively intended for river navigation. From returns received from this country it appears that the tonnage of barges, lighters, and other river vessels launched during 1910 amounts to about 15,000 tons.

Three steamers of 5,000 tons and upwards were launched, the largest being the Prinses Juliana, 8,055 tons, built at Amsterdam.

Norway.

The output for 1910 amounted to 36,931 tons. This is an increase of about 8,000 tons on the 1909 figures, but is a much smaller total than that returned for several previous years. The figures include only two vessels of over 1,500 tons, the largest being of 1,701 tons.

Japan.

The figures for Japan (30,215 tons) continue to show a decreasing output. They are 22,000 tons less than those of 1909, and are the lowest reported since 1902. Included in the returns are two steamers of about 6,000 tons each.

Other Countries.

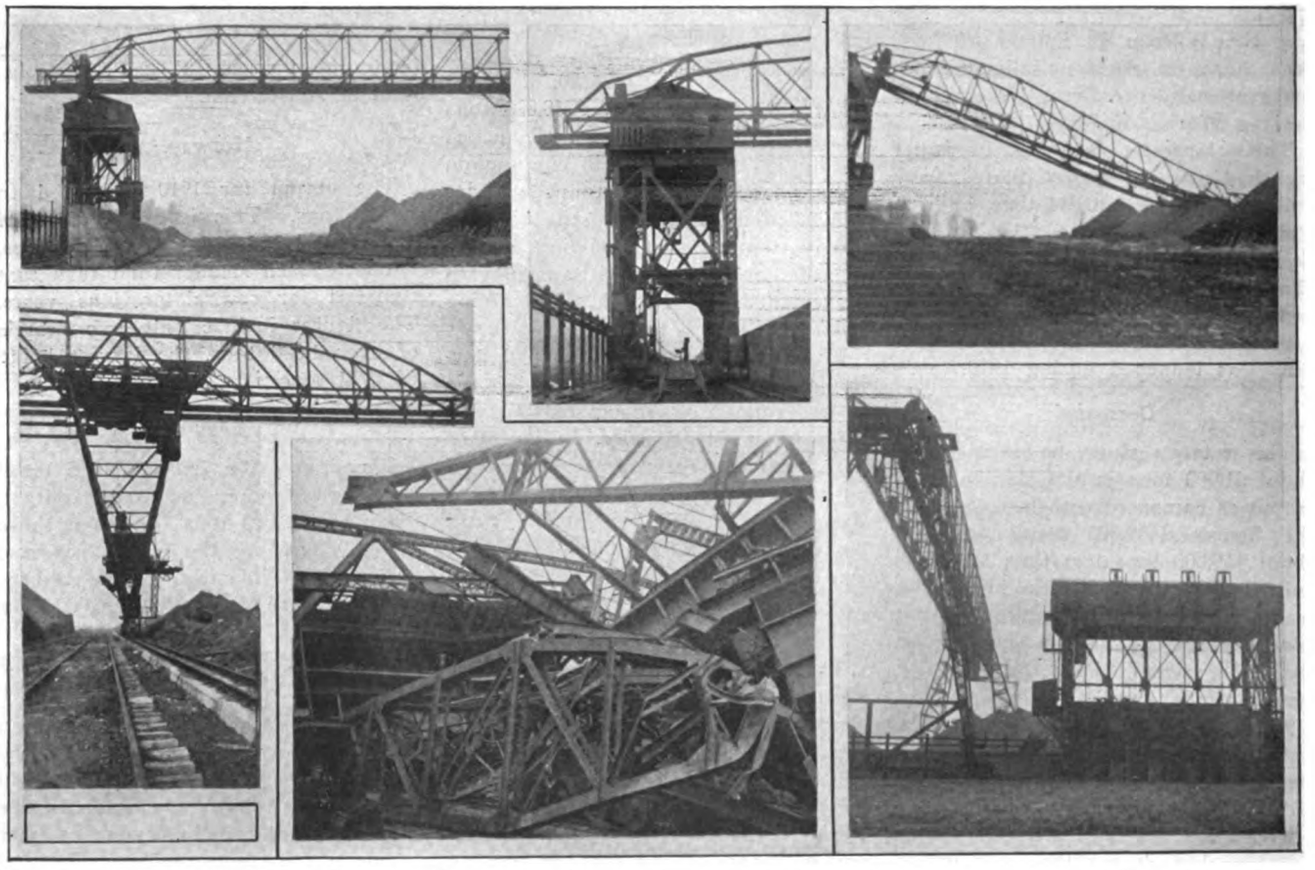
The only other countries with an output of over 20,000 tons are the British colonies (26,343 tons) and Italy (23,019 tons). The total for the British colonies includes one steamer of about 6,500 tons, built at Collingwood, Ont. Among the vessels launched in Italy are four steamers capable of a speed of 22 knots, two of which are fitted with turbines.

ORE BRIDGE AT RANDALL DESTROYED

THE new ore bridge, built by the Erie railroad, to handle the ore at its Randall, O., yard, and leased to Pickands, Mather & Co., of Cleveland, was destroyed by a charge of nitro-glycerine on Saturday evening, March 25. This new bridge had but recently been completed by Heyl & Patterson, of Pittsburg, and commanded an ore yard of approximately 15 acres. The bridge was wrecked by men evidently experienced in the art of using explosives, for they put the charge where it would do the most damage. In fact, the greater part of the damage was done by gravity, the weight of the falling structure snapping trusses and twisting the various parts out of all semblance to the original structure.

The bridge traveled on two piers with a span of about 500 feet between. The pier selected by the wreckers, Fig. 4, was that which contained the operator's car with the motors for operating the structure. By breaking this pier with a charge of nitro-glycerine, the unsupported parts did the rest of the mischief, falling heavily in a westerly direction. So great was the strain that the trucks were torn from the tracks, though locked to them by heavy cast iron clamps. The cost of the bridge was $120,000 and the wreck entailed by the explosion practically amounts to a rebuild. This is the fourth structure of its kind, built by Heyl & Patterson, to be wrecked and as there is great similarity in the work of destruction, it is quite likely that the same men, or men belonging to the same set, did the work. Sufficient fuse was found scattered about the yard to enable the men to have had a good start before the explosion took place. Bloodhounds were sent to the scene in an endeavor to pick up the scent, but without much success. The Erie railroad is now offering a reward of $5,000 for information leading to the arrest and conviction of the dynamiters. The plot to wreck the bridge appears to have been thought out in every detail. Aside from the damage itself, it comes at a most embarrassing time to the railroad company, as the movement of ore to the valleys is about to begin. The work of reconstruction will begin immediately, but it will take about two months to put the plant again in working order.

Some idea of the mischief done may be gathered from the accompanying illustrations. Fig. 4 shows the leg that was destroyed. This leg or pier rested upon a truck, which was carried upon eight wheels, four at each end. It was just above the four wheels at the westerly end of the truck that the charge of nitro-glycerine was placed. The blast broke the leg and caused the unbalanced parts to pitch in a westerly direction with such violence that the easterly wheels of the truck, though securely locked, as stated, with enormous cast iron braces to the track, were lifted about 10 feet into the air, the truck itself practically snapping in two. The easterly wheels, over which the blast was placed, remain on the track, as shown in Fig. 5, which shows how completely the structure was demolished. Fig. 3 illustrates the bridge as it appeared after the collapse of the leg, the



ORE-HANDLING EQUIPMENT, BUILT BY THE ERIE RAILWAY, WHICH WAS DESTROYED BY A CHARGE OF NITRO-GLYCERINE.

Fig. 1—Side Elevation of the Car Dump and Retaining Wall.

Fig. 2—A Nearer View of the Car Dump.

Fig. 3—Ore Bridge After the Explosion.

Fig. 4——The Pier that was Blown Up.

Fig. 5—The Pier After the Explosion.

Fig. 6—Front Elevation of Car Dump Looking North.

leg itself, of course, being hidden by the ore piles intervening.

One of the most interesting features of the ore equipment of the Erie railroad at Randall, which fortunately was not molested by the wreckers, is the new car dump, built by the Wellman-Seaver-Morgan Co. Fig. 1 shows its side elevation with the concrete retaining wall to the north. The southerly leg of the ore bridge is hidden by the car dump in this view. It might be stated that the trucks of this leg were lifted from the tracks by the collapse of the bridge. Fig. 2 gives a closer view of the side elevation of the car dump looking west. The car dump is a movable structure and is, of course, quite independent of the ore bridge.

It will be understood that the Erie railroad has established this ore yard at Randall, because there is no longer room in the old riverbed at Cleveland to accommodate its ore piles. As the ore trains arrive from the lake front, the cars are shunted one by one upon the car dump which lifts them and then dumps them over the concrete retaining wall, from which point the ore is picked up by the clam shell bucket, operated by the ore bridge and carried to the group of ore, to which it belongs.

The car dump is electrically-operated, having a 75-horsepower motor for moving and two 225-horsepower motors for lifting. The machine is designed to lift a car every two minutes or 30 cars an hour, having a total lifting capacity of 224,000 pounds, which is in excess of present requirements. The machine will take a car as low as 6 feet 3 inches over-all and as high as 12 feet 6 inches, with a maximum width of 12 feet, which is wider than any existing car. It is designed with the intention of being adequate for all possible future development. The motors are helped in lifting by a system of counterweights which also assist in holding the car while dumping and aid as well in lowering. The counterweights weigh 36,000 pounds and perform the triple function of lifting, balancing and clamping. The controllers are of the magnetic switch type and the machine is provided with a solenoid brake arrangement, designed to hold the machine in a stationary position should there be at any moment a failure of current. The machine is provided with a patent clamping device so arranged as to clamp the car without jamming it. It automatically frees the car upon reaching the ground. The gears all have cut teeth and the wheels are of cast steel. The car dump, which has been constructed under G. H. Hulett's patent, is also provided with a platen or horizontal moving table. The main structure of the machine supports a rotating cradle in which the car is held. As soon as the car has been properly placed on the platen or moving table, the hoisting machinery for revolving the cradle is set in motion. The forward side of the cradle, that is the side next to the ore yard, is supported on heavy trunnions, about which the cradle is made to rotate. When the machinery is started, the cradle begins to rotate about these trunnions and this motion of rotation continues until the cradle with the car is inverted to the proper position to discharge the contents of the car into the ore yard. During this motion of rotation, the platen, upon which the car is resting, moves horizontally until the side of the car rests against the cradle. The further continued motion of rotation engages the clamps, which hold the car in position on the cradle when the cradle is inverted.

New Car Dump on Erie Docks

WHEN navigation opens, or shortly thereafter, vessel owners will find a new car dumping machine on the Erie coal docks below the Superior avenue viaduct, at Cleveland. This new car dump is being built by the Wellman-Seaver-Morgan Co., and will be operated by the Pittsburg Coal Co. The location of the dock and the local conditions surrounding the car dumper are such that it is not practical to bring the cars in at a sufficient elevation to dump them directly into the boat, without first hoisting and the machine is so constructed that the cars are first hoisted and then the coal is dumped through a chute into the boat.

The main framework of this machine supports a hoisting and rotating cradle upon which the loaded cars carry. The storage yard for the loaded coal cars is located along the bank of the river and extends a considerable distance from the car dumper. These tracks are arranged with a sufficient down-grade, so that the cars may be run down a gravity track to the lower end of the incline approach leading to the machine. The cars are drawn up this approach and spotted on the platen of the car dumper by means of a mule car, which is operated by a haulage rope wound on a drum in the machinery house, which is located in the rear part of the main framework. This mule car is arranged to run on a narrow gage track between the approach car tracks, and at the bottom of the incline it runs into a pit which depresses the mule car sufficiently so that the incoming loaded coal cars will pass over. The cars are dropped down the gravity track, one at a time, and as soon as the car is at the bottom of the incline approach, the mule haulage engine is started and the mule car coming out of the pit engages the rear coupler of the car and pushes the car up the incline and into position on the platen. The platen is mounted on the cradle in the same manner as in the movable car dumper, but the cradle hoist and rotating ropes are passed completely around the cradle so that the first motion of the car when the cradle hoist engine is started is in a vertical direction. This vertical hoist continues until the cradle reaches the proper point to discharge into the pan or chute leading to the hatch in the boat. On account of the very varying sizes of the boats which this machine is required to load, the pan is made adjustable. This adjustment is accomplished by means of hinging the pan to a movable girder located at the front of the machine, this girder being hung on two large screws which are located at either end. These screws work through nuts, which are securely connected to the girder and the screws are operated by means of an engine in the machinery house at the rear of the main framework. By means of this screw mechanism the height of the girder may be adjusted within the required limits for discharging coal into various size boats. This pan girder is supplied at the rear side with heavy hooks, which engage pins on the cradle and the cradle is hoisted until these hooks engage the pins, when the motion of rotation of the cradle begins. This pan is also arranged so that it may be hoisted to clear the rigging of the boats. At the point where the pan is connected to the girder, the width is sufficient to take the coal discharged from the full length of the car, but this width is contracted at the forward end of the pan to a width of about 6 ft. and the lower end of the pan terminates in a vertical leg or chute. This chute is hinged to the pan and is provided with the necessary mechanism to swing toward the dock or away from the dock, as required, for the purpose of distributing the coal into the hold.

The bottom end of this vertical chute is provided with a trimming device, which is designed to swing lengthwise of the boat, thus giving

further facilities for distribution of the coal. The swinging of the vertical chute, as well as the fore and aft movement of the trimming device at the bottom of this chute, are operated by means of a small engine which is fastened to the pan, and has the necessary drums for controlling the operating ropes.

The levers for controlling the movements of the vertical chute and the trimmer at the bottom of the chute, are located on the operator's platform at the top of the vertical chute.

The mechanism for hoisting and rotating the cradle is located in the machinery house in the rear part of the main framework. This mechanism consists of a pair of 22 in. x 24 in. single-acting engines, which are geared to heavy winding drums, upon which the cradle hoist ropes are wound. The ropes from these drums are carried over deflecting sheaves in the framework and around the necessary operating sheaves connected to the cradle.

The screw hoist for the pan girder, as well as the pan hoist, is operated by means of a 14-in. x 18-in. engine, located also in the machinery house. This engine is directly connected to the hoisting screws by means of gearing and shafting, and this mechanism is controlled by means of friction clutches. The pan hoist is controlled by means of ropes which are wound on a drum and also connected to this engine. The ropes from this drum are carried up through the structure of the machine and passed around sheaves in the structure and on the pan in such a way that the pan may be hoisted in a vertical direction, to clear the rigging of the boats. As the pan is hoisted to this position the vertical chute attached to the outer end of it folds up close to the pan so that a minimum clearance is required.

The engine for operating the mule car, consists of a pair of 16-in. x 20-in. single-acting engines, geared to a winding drum. The rope from this drum, after passing around the necessary deflecting sheaves, is connected to the mule car, which is at the bottom of the incline approach, as described.

For operating the engines used in connection with this machine, a boiler plant is provided, which is located adjacent to one end of the main framework. This plant consists of a battery of three, Class A, Special No. 10, Stirling boilers, each having a rated capacity of 150 HP. In addition to these boilers, there is also a feed water heater.

The operator controlling the various motions of the car dumper, is stationed at a convenient position over the incoming car track in the main framework of the machine, and all of the necessary controlling levers for operating the several engines, as well as a lever for controlling a sprinkling device located at the bottom of the incline, are located in the operator's house.

The speeds at which this machine operates are such that cars can be handled at the rate of 30 per hour. The cars are drawn up the incline approach, as previously described, and after being properly located on the cradle, the cradle hoist engines are started and the car hoisted to the proper position for dumping into the pan. As soon as this position is reached, the motion of rotation of the cradle begins and the contents of the car is discharged into the pan and runs down through the vertical chute into the hold of the boat.

During the motion of the hoist, the platen moves sidewise until the side of the car rests securely against the cradle. A further continued motion of hoist automatically sets the car clamps which hold the car in position on the cradle when in an inverted position. These clamps are arranged so that they are automatically adjustable to any size of standard car, and are operated by means of heavy counterweights, running in guides at the rear side of the main framework. The arrangement is such that no attention of the operator is required to set these clamps and they release automatically when the car has returned to the original position.

After the coal has been dumped into the pan from the car, the cradle carrying the car is again lowered to its original position and the machine is ready to receive another loaded car. This second car will be drawn up the incline by means of the mule and will be located on the platen, as before described. In coming onto the platen this car will push out the empty car, which then runs down a gravity discharge track at the opposite side of the car dumper, onto a kick-back and will run down a gravity track to the empty car storage. The operation of the car dumper will then be repeated, as described.

Two Tugs for Philadelphia

The two new tugs Kensington and Smetwark, built for the department of wharves, docks and ferries of the city of Philadelphia, by the Waters-Colver Co., West New Brighton, Staten Island, N. Y., were delivered to Philadelphia the opening day of the inside route between Philadelphia and New York. The Kensington measures 81 ft. long, 20 ft. breadth and 9 ft. depth, 65 tons, with a compound engine 12 x 26 x 18 in., and one Scotch type boiler 10 ft. 6 in. x 10 ft. The Southwark measures 42 tons, is 66 ft. long, 16 ft. breadth and 7 ft. depth of hold, with a single engine 14 x 14 in. with one marine type boiler 5 ft. 6 in. x 10 ft. These tugs are of wood and will be used in the service of the dock department, city of Philadelphia.

Boiler Accident on Battleship Delaware

The Babcock & Wilcox Co. recently applied to the navy department for a copy of the findings of the court of inquiry into the recent boiler accident on the battleship Delaware, and received the following reply:

In compliance with the request contained in your letter of Feb. 24, and with the approval of the department, the bureau submits for your information the following general statement of the finding and opinion of the court of inquiry, appointed to inquire into the accident to boiler "O" of the Delaware:

(a) An explosion occurred in boiler "O," Jan. 17, 1911, by which three rear headers, Nos. 8, 9 and 10, were blown bodily out of the boiler.

(b) These headers were found severely bowed, their tube faces were bulged, and the metal showed signs of overheating. All the back headers of the outboard half of the boiler, 13 in number, were more or less bowed, the degree of distortion diminishing toward the outboard side of the boiler.

(c) The inboard half of the boiler was uninjured, and subsequent comment refers only to the outboard half.

(d) The 4-inch tubes next the fire were all more or less bowed near the back ends, and showed signs of having been burned; and the majority of the 2-inch tubes were more or less distorted, while a number showed signs of having been white hot.

(e) The front headers were in good condition.

(f) The superheater tubes and manifolds showed a red color, and the 4-inch tubes through the first and second passes showed the blue color characteristic of overheating.

(g) On two of the headers blown out were found scores and dents, made by the headers striking obstructions. The character of the scores and dents, and the blue color of the metal in the scores, indicated that the metal of the blown out headers was in a softened condition, due to heat, when they struck.

(h) The three headers showed unmistakable signs of having been very hot. They showed the characteristic blue color following overheating, and the tube face of each had been bulged out by internal pressure, possible only when the metal is heated to a condition approaching redness.

(i) The greatest heat appeared to have existed at about the width of the height of the header, but the effects of overheating were manifest in all the back headers of the outboard half of

the boiler, diminishing either way from the zone of greatest intensity of heat, which appeared to exist opposite the headers that were blown out.

(j) A number of 2-inch tubes of the blown out headers gave evidence of having been white hot. The surface of these tubes, near the back ends, appeared burned, and was covered with a coating of black oxide of iron. Signs of overheating were also in the outboard half of the drum, from which much of the soot had been burned off.

(k) From a consideration of the preceding facts, the court concluded that the explosion was due to the lack of a sufficient quantity of water in the boiler, and that the water tender on watch at the time was responsible for this condition. This opinion was strengthened by the fact that it was possible to enter the fire room with safety a very short time after the explosion occurred, which would not have been possible had the boiler contained the normal quantity of water.

(l) All testimony showed that the boiler was in good condition prior to the accident, and that the regulations regarding the care and preservation of boilers had been carried out; that other boilers, which had been subjected to the same use, were in good condition; and that the overheating noted in the injured boiler would have produced the results observed by the court after the accident, no matter how perfect the boiler.

(m) From some testimony before the court, the conclusion was reached that the reading of the water gages was misleading, although the gage glass fittings are recognized as simple and reliable; other testimony, however, led to the opinion that the opening of the feed check valve had been increased shortly before the accident occurred.

Very respectfully,
(Signed) R. S. GRIFFIN,
Acting Chief of Bureau.

Concerning the finding, the Babcock & Wilcox Co. says by way of explanation:

"The accident occurred about 9:15 a. m., Jan. 17, while the Delaware was bound for Norfolk, Va. The ship was proceeding under easy steam, but on account of poor draft, the fire rooms were closed and working under an air pressure of ¼ in. This, under the circumstances, was not more than good natural draft, so that the rate of combustion was about 18 lbs. of coal per sq. ft. of grate. The boiler is one of the well known Babcock & Wilcox marine type, with 4,425 sq. ft. of heating surface and 103 sq. ft. of grate surface, there being 14 boilers in all. On trial, the Delaware developed nearly 30,000 horsepower, so that this boiler, when worked under forced draft, has a capacity of over 2,000 horsepower.

"It is very interesting to note in this connection the statement of the commanding officer, made to the correspondents of the newspapers, who boarded the ship upon her arrival at Hampton Roads. It appears from these statements that, although the captain was on deck at the time of the accident, he did not know that one had occurred until it was reported to him some minutes later. In other words, the explosion did not make sufficient noise to attract attention on the upper deck.

"The damage was confined to boiler 'O' and the extent and nature thereof are set down in the findings in considerable detail. It is also to be noted that the structure of the vessel was not injured at all, thus emphasizing again the fact that an accident to a water tube boiler involves the minimum of damage. The boiler was repaired while at Norfolk with some new headers and new tubes, most of the work being done by the engineer department of the ship.

"There is one point in the finding which needs just a word of explanation to make it perfectly clear. The court finds that only the outboard half of the boiler was damaged. It might seem at first glance as though it would be impossible for one-half of the boiler to be injured and the other escape. The explanation, however, is very simple. The feed water enters the boiler in the steam and water drum, which is above the front headers and connected to them by nipples, and is discharged through an internal feed pipe perforated with holes on its lower side. This pipe extends from the check valve at the inboard end of the drum to a short distance past the center of its length. As long as the water in the drum was above the tops of the nipples mentioned, it would not, of course, make any difference where the feed water was introduced, as it would naturally find its level. In case of low water, however, due to inadequate feed, there might be under moderate combustion, just enough water to save the inboard half of the boiler, where the water would go directly down the nipples, while only a few headers and associated tubes on the other side would get any. This appears to be the explanation of the salvation of the inboard side of the boiler.

"With this general statement of the surrounding conditions, we believe the finding of the court will be entirely clear, and it seems to us that the court is to be congratulated on the very careful analysis which they have made of all the circumstances of the case, so that the reasons for their conclusion that the accident was due to low water are perfectly evident and convincing."

Floating Dry Dock at Manistee

The Manistee Iron Works Co., Manistee, Mich., has added a floating dry dock to its plant, capable of lifting vessels up to 200 ft. in length and 50 ft. beam. The dock can lift approximately 1,600 tons. The company has also added a pair of shear legs 120 ft. high, capable of raising 75 tons. The machine shop comprises 93,000 ft. of floor space and is equipped with the most modern iron-working machinery and as the wood-working machinery is quite complete, the plant is equipped to take care of all classes of boats. The company is now equipping a number of vessels with new boilers and reports the volume of business to be quite satisfactory. The number of vessels wintering at Manistee has increased 50 per cent over former years.

Taylor Stokers

The American Ship Windlass Co., of Providence, R. I., reports the following recent orders for Taylor gravity underfeed stokers: Sixteen seven-retort stokers from Stone & Webster, for the new Boston elevated railway plant, at South Boston; 56 seven-retort stokers for New York Edison Co.'s two waterside stations; three four-retort stokers for the Detroit public lighting plant, Detroit, Mich. (repeat order); one six-retort stoker for the Pfister & Vogel Leather Co., Milwaukee, Wis.

The selection of Taylor stokers for the New York Edison Co.'s plants is of particular interest because of the fact that this company has conducted extensive experiments on various types of stokers since the completion of Waterside station No. 2. The 56 stokers ordered will be installed under 56 650-h. p. Babcock & Wilcox boilers, which have heretofore been hand-fired.

The desire on the part of the company to increase the steaming capacity of these units to take care of a recent large increase on the generating end led to the decision to install automatic stokers. That the stokers ordered should be of the Taylor type, of which there are already 13 in this station, should prove of unusual interest to combustion engineers.

W. M. Mills, manager of the fleet of vessels owned by the Tonawanda Iron & Steel Co. says that the vessels will not be put into commission during the coming season for the reason that he can secure tonnage for less than it costs the company to operate its own vessels. Mr. Mills recently sold the three largest vessels of his fleet to the Pittsburg Steamship Co. The vessels which are to be laid up are all small ones and do not include the steamers J. G. Munro, D. B. Meacham, James Corrigan, Wm. A. Rogers and Charles Weston.

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published monthly by

Penton Publishing Co.

PENTON BUILDING

CLEVELAND.

CHICAGO.....1328 Monadnock Blk.
CINCINNATI.....808 Provident Bank Bldg.
NEW YORK....Room 1115 West Street Bldg.
PITTSBURG.....2148-49 Oliver Bldg.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, U. S. and Mexico, $1.00 per annum. Canada, $1.50. Foreign, $2.00.
Single copies, U. S. and Mexico, 10 cents. Elsewhere, 15 cents. Back numbers over three months, 25 cents.

Change of advertising copy must reach this office on or before the first of each month.

The Cleveland News Co. will supply the trade with THE MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

April, 1911

THE MARINE REVIEW can be found on sale at the following news stands:

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Naval Cost Keeping

In the March issue of the *Engineering Magazine* there appears an article written by J. Mendenhall, on "Cost Accounting in the U. S. Navy." This is published by permission of the navy department and is another attempt to bolster up the discredited Meyer administration. Mr. Mendenhall, however, by his own statements proves every assertion that has been made in previous issues of THE MARINE REVIEW regarding naval costs.

A few of the misleading statements and evasions in Mr. Mendenhall's article require attention.

He attempts to make excuses for not including many of the real expenses of production in the cost of the work, and states:

> There are many expenditures applicable to the industrial part of the yard which cannot, under the law, be included as overhead or indirect expenses in the cost of productive work, as appropriations are specifically made for them by congress. The latter consists of such items as salaries of officers, salaries of the clerical force, draftsmen, civilian assistants, sub-inspectors, expert aides, chemists, watchmen, messengers, etc.

If Mr. Mendenhall's statement be true, is there any reason why in determining the cost of the work the amounts paid should not be pro rated to the work? Cannot these men be *paid* from these appropriations, and at the same time the cost records show the *actual* cost of the work? Does Mr. Mendenhall expect us to believe that these appropriations prevent the records from showing *actual* cost? If Mr. Mendenhall is an expert accountant he knows that it is a simple matter to keep the cost records and the record of expenditures under these various appropriations separately. Mr. Mendenhall further states that the attorney general *by implication* decided that these payments should be located against the proper appropriations. The attorney general's "implication" can be carried out and at the same time the mandatory law of congress that "in fixing the cost the direct and indirect charges incident thereto shall be included in such cost," can be complied with. Mr. Mendenhall does not attempt to explain the reasons for violating this law. If Mr. Mendenhall desired such exactness in charging to appropriations will he explain why one clerk in his accounting office is charged to one appropriation, and another clerk in the same office doing identical work is charged to another appropriation?

After enumerating the large expenses which are not charged in the navy yards against the cost of the work, and admitting that they must be charged in a private yard, the following statement is at least extraordinary:

> It will be seen therefore that all per diem employes of the navy yards are entitled to twenty-seven days' leave and holiday per annum. As no such conditions exist in commercial establishments, *it would be inconsistent to charge these expenditures to the cost of productive work.*

Does Mr. Mendendall wish us to believe that he is consistent? If so, why in the next paragraph of this article does he admit that disability payments are not included in the cost of work? He does not even state that the attorney general has *implied* that this should not be done. We assume that Mr. Mendenhall knows enough of industrial work to know that private establishments have these expenses and that they must be absorbed by the cost of the work.

Mr. Mendenhall states:

> In order to determine what charges shall constitute replacements, a limit of $100 has been placed upon certain expenditures chargeable to the classification of accounts under shop, power and general expenses—that is, if a repair job on a machine, tool, building, or other equipment is estimated to cost $100 or more, the officer in charge has instructions to issue a special job order, charging the cost of this order to the appropriation under which the expenditure was authorized.
>
> It has been stated that by setting this limit of $100 the officers in charge of the different shops may evade paying for expenditures from their appropriation, by splitting the work over several jobs and charging it to shop expense. Should this be the case the officer in charge of the work, who approves the job order, would be violating the regulations. By doing so, he would also be increasing his shop percentage, and it necessarily follows that such a procedure would be detrimental to the economical operation of his shop. By comparing the increases or decreases as shown in the shop percentage statements previously described, the manager of the yard can immediately discover any appreciable increase, and hold the officer in charge strictly to account.

This statement may deceive naval officers but it will not deceive anyone who has industrial experience, nor will it deceive anyone who knows navy yard conditions. Will Mr. Mendenhall explain the bearing of his explanation on the following case: The civil engineer is charged with keeping the railroad tracks in order. He has limited allotments under special appropriations to do this work. He desires to make the best record possible with this money, and all the work that he can charge to general expense is just so much velvet—it does not come out of his allotment. He decides that a certain piece of track requires repairs and he makes

an estimate to do the work; if the *estimated* cost is over $100 it is charged to the appropriation, but if the *estimate* is less than $100 it is charged to general expense. It is the *estimate* which decides the appropriation to which the work shall be charged. Assume that the estimate is less than $100. When the estimated cost has been reached if he is a careful civil engineer he will take the men away from the job to another piece of work and come back to the first job in a week's time with another estimate.

This is only one of a thousand ways in which the accounts can be juggled and *are juggled*. Mr. Mendenhall must not be a close observer, for during the time he has been in navy yards he has had sufficient opportunity to learn what is going on.

Mr. Mendenhall states:

> At some of the yards the *officers* in charge of the work have requested that they be advised daily of the total labor, indirect expense and material charged to each job order under jurisdiction. *Objections* have been raised, however, to furnishing them this information, as it provides the foreman, leading man, or quarter man, in charge of the work in each shop, a means of diverting charges from one order to another, so that their work may compare favorably with the estimates.

It will be noted that Mr. Mendenhall refuses to give officers in charge of work daily expenditures against the jobs because it provides the foreman, leading man or quarter man a means of diverting charges from one order to another. Will Mr. Mendenhall explain the connection between the officers in charge having this information and the juggling of charges by the foreman, quarter man and leading man?

> When the expenditures on a job order are within 70 per cent of the estimated cost, the accounting officer informs the heads of the divisions to that effect. This enables the officer in charge of the work to investigate its progress, and if the work is not within 70 per cent of completion, to ascertain the cause for the over-expenditure.

Mr. Mendenhall kindly lets an officer know when expenditures have reached 70 per cent of the estimate. Will he explain why the juggling should not take place then? This is indeed a wonderful system when the officers charged with the expenditure of millions of dollars cannot be told the daily expenditures on each job!

There are many other misleading and inaccurate statements contained in Mr. Mendenhall's article, but further space can not be devoted to consideration of a system which the author himself proves to be valueless.

[The author might well have asked why, if the Meyer cost system and methods are so perfect, Messrs. Emerson and Gantt have been recently engaged by the department to institute modern scientific methods in navy yard management. Mr. Emerson is one of those suggested by MARINE REVIEW* on a navy yard commission, and Mr. Gantt is the pupil and collaborator of another, F. W. Taylor. While the department will undoubtedly profit from their labors in respect to shop methods, there is no probability that the existing dishonest cost system will be rectified so long as Meyer and his little ring are in control —Ed. M. R.]

*January, 1911.

Our "Fighting Officers"

No more conclusive proof of the culpability and utter incapacity of the present naval administration could be adduced than the efforts now being put forth in the department to learn the sources of THE MARINE REVIEW'S information. The decision to "interrogate" certain officers became known some weeks since even to the names of those who were to be haled before Pooh Bah Meyer and put through the third degree. So far the activity is only extremely interesting; none of the names yet suggested having any connection with matter heretofore published in THE MARINE REVIEW, nor is it likely that any will be, for very good and sufficient reasons. We said in an earlier issue:*

> The statements actually printed were much modified from those submitted and not anonymously either; nor is the standing or reputation of those officers, who rallied by Meyer's order to his defense, one whit higher than of our correspondents.

We will go further and add rank and that in some, or rather many, respects they are not even in the same class. If the drag net brings in some subordinate official, who can be made a scapegoat, rightly or wrongly, the opportunity will not be neglected, but that is as far as the bluff will go. Meyer dare not risk a discussion or investigation of his administration nor of his "plans" at the hands of those whose experience, judgment and ability is equal or superior to those of any of his advisers and immeasurably greater than his own.

We might add further, however, that such of our information as is not derived from first hand observation and inquiry, does not come from those who are so fond of listing themselves as "fighting officers," but whose chief achievements have been mostly the waging of successful war to obtain and hold down easy shore berths.

We have heard much during the past year about the fighting heroes of our navy. Let us see where they are. Are they at sea with those wonderfully complex fighting machines, of which we hear so much and for which we pay so much, or are they ashore, holding down the tempestuous and dangerous swivel chair? The general public knows, of course, that a few naval officers are ashore; they are met at White House receptions, at pink teas (and elsewhere), but the average citizen believes that the great majority of these war-like heroes of the navy are at sea in the practice of the profession for which they were educated at his expense.

Here are the facts, taken from the navy department register. Of 27 admirals and rear admirals, *19 are ashore, holding down swivel chairs.* Of 83 captains, *53 have shore stations;* of 177 commanders, *76 are ashore;* of 209 lieutenant commanders, *95 are ashore.*

When we come to the grade of lieutenant, which is made up mostly of young officers, many of whom were turned out from the naval academy only four or five years ago, and whom we should expect to be at sea, gaining practical experience in their profession, we find that of 354 in this grade, *185 are on shore duty.* So only 30 per cent of our admirals; 37 per cent of our captains; 35 per cent of our commanders; 54 per cent of our lieutenant commanders, and 48 per cent of our lieutenants are actually afloat. Of all ranks, over 54 per cent are ashore. Hail! to the fighting officer"!

The foregoing fully explains the opposition of line officers to efficiency methods in the navy. When Mr. Newberry was secretary of the navy, he told the naval committee that the government could save money by building homes for these officers at some fashionable resort and ordering them there on full pay instead of placing them in positions of responsibility in the shore establishment. There is no question that Mr. Newberry was right, but it is

*January, 1911; page 74.

equally true that among the "fighting officers" Truman Newberry is probably the best hated man in the United States in consequence, which is merely the more to his credit.

The 54 per cent who are now ashore know that with an efficient organization they are in danger of losing the swivel chair jobs. The greater part of the 46 per cent now afloat are looking forward to their turn at the aforesaid swivel chairs and they also know that with business-like methods their turn will never come. Thus the "fighting officers" are practically a unit in their fight on reform and herein lies their only bellicose characteristic.

This is the real reason for the active press agent work now going forward and of the false and deliberately misleading statements, made to bolster up the so-called Meyer organization. The old belief that an officer and a gentleman were synonymous terms and that flawless honor was one of their attributes is in need of repairs.

Another interesting field for investigation is the retired list of the navy. It will be found that officers are placed on the retired list with the rank and three-fourths pay of a rear admiral, when they never commanded a fleet or a division of a fleet; some have never commanded anything more than a small gunboat, *and there are a number who have never held a command of any sort.* There are also cases where officers in their prime, at 40 to 45 years of age, have been retired at their own request with the rank and three-fourths pay of a captain *in order to make promotion for others.*

It will astonish many to know that while there are 27 admirals on the active list, there are *189 admirals and commoders* (this grade is now merged with the admiral grade on the active list) *on the retired list.* There are 199 captains and commanders on the active list and *130 on the retired list.* As the officers on the retired list receive three-fourths the pay they would receive if on the active list, the subject is worth some thought. It makes little difference from what angle the naval question is approached, a close view discloses its need of renovation, if nothing worse.

And finally, merely that the interest of the department may be stimulated, we may add that the editorial on naval cost keeping, in this issue, is from the pen of another naval officer of high rank and whom we welcome as a new acquisition. His knowledge of his subject is manifest.

Navy Accounting

Editor MARINE REVIEW, Sir:—In your recent articles criticising navy accounting it seems to me that you have missed one of the most salient points in the system's inefficiency. That is in the method of comparing efficiency of officers and supervisory force at the various yards. As you are undoubtedly aware, the percentage of overhead charges is based upon the "productive labor" of the shops. This productive labor takes the place of output upon which these same figures would be based in a private business.

As an example of the fallacy of these methods, let it be supposed that the efficiency of a machine shop for two months is to be compared. The shop expense and productive labor in this shop for one month was as follows, the shop expense including power and all other indirect charges:

Shop expense.	Prod. labor.	% Indirect.
$2,000.00	$8,000.00	25%

Now during the following month there comes a change of management (as is frequently the case in navy yards) and the new officer in charge by installing modern systems and methods of shop practice produces the same amount of work in actual value as was produced the previous month, but is able to reduce his direct or "productive labor" to $7,000 without increase in the overhead charges. His per cent indirect would then be 28.57, apparently an increase of 3.57 per cent over the previous month with also an apparent decrease in efficiency under the new management. It is a well known fact that it is much easier to analyze the overhead charges than the direct labor in a shop and it is presumed that the overhead charges in this shop are at a minimum. It is therefore impossible for this man to show an increase in the efficiency of his shop except in one way, that is to increase his productive labor. This may be done in two ways, increase the pay of the men by re-rating to first class a number of men who may be only worth second or third class pay, and also by charging to productive labor men whose time properly belongs to the shop expense. In other words, the system is simply an invitation to make improper charges, the reward being an apparently increased efficiency. On the other hand, an officer or foreman who is efficient and sufficiently interested in his work to institute modern methods and actually increase the efficiency of his shop by legitimate methods can be assured that his efforts will be without appreciation, as the reports to the bureaus and department show an increased shop expense, and that is what counts. If it were possible to compare similar costs at different yards, it might be possible to obtain a line on the efficiency at each, but similar jobs are very rare in the navy as the work is practically all repair work and conditions under which apparently similar work is carried on are usually very different. If it is desired to obtain comparisons, let the inspection force at each yard place a value upon the completed work, and let the accounting department run a profit and loss account for each shop. Base your figures of overhead charges on the ***value*** of the output and there will be some incentive for stopping the leaks and saving the dollars to which the present system attaches a penalty.

OBSERVER.

Philadelphia, Pa.
Feb. 27, 1911.

Like a Flash of Lightning

Editor MARINE REVIEW, Sir: — The editorial in your March issue entitled "Confusing the Issue," comes like a flash of lightning through the lowering clouds of misrepresentation and calumny which have been hovering about the heads of that splendid and almost universally recognized as highly efficient organization of our navy, the Construction Corps, since the advent of Mr. Meyer as secretary. Were it not for the judicial and investigatory spirit displayed by the House Committee on Naval Affairs, there apparently would be but one side to this controversy, for the lay press has heard and published almost nothing but the vituperative and misleading emanations from the Meyer advocates. But the very zeal of the creators of this kind of stuff promises to be instrumental in bringing about a proper appreciation of the real status of affairs in the navy, since blind partisanship almost invariably leads to a reaction and ultimately correct understanding of a situation. The excellent and patriotic work of our small body of naval constructors, doubtless the most

highly trained of any navy in the world, is duly appreciated in other maritime countries, and it is doing our navy little good in the eyes of the people and of the world that jealousy of the Construction Corps should cause others to endeavor to belittle these results by misrepresentation, and to impair the efficiency of the organization by handicapping its efforts.

The article in *McClure's* for March reads as though Reuterdahl, the original apparently inspired detractor of the work of the Construction Corps, was not far away at the time it was written, and where such a willful attack upon the work of the corps is made, it seems to me it would have been much more courageous for the author to have come out into the open without the cover of anonymity, for he is attacking a fine set of officers and gentlemen who he knows are prevented by navy regulations from replying. It is too bad that the secretary of the navy and others are at liberty to make statements concerning the work of the Construction Corps, which at times are so misleading, without the officers of this corps having an opportunity to be heard in their own defense, and I should like to see an article prepared by the writer of your editorial in reply to the article in *McClure's* published in some medium circulating in the channels where *McClure's* finds its readers. Of course, a publication so excellent as yours, even though it be technical, has a large circle of non-technical and appreciative readers, yet an appeal to the popular idea, such as that made by the article in *McClure's*, would give the general reading public a little light on the other side of the question. However, the House Committee on Naval Affairs is not going to be misled by ex parte statements, and we can feel confident that they will sift the entire matter whenever they reassume the task of investigating the so-called "Meyer plan" and that its true inwardness shall come to light.

Very truly yours,

CORINTHIAN.

Memphis, Tenn.
March 21, 1911.

Keep Up Your Broadside

Editor MARINE REVIEW, Sir:—For the good of the marine interests of the country keep up your broadsides on the navy. You have your facts right and there is no refutation. I was for some years a technical employee at Washington in the navy department and know too well whereof you write, and that you have not touched all by a great deal. Don't fail to get at that unsigned author in late *McClure's* which gives Secretary Meyer a coat of whitewash so thick that, like Ballinger's, it fails to stick—peels at the edges.

By the way, cannot you collect all this navy argument, both on administration and coal, and get it into book form so that the large mass of readers who are afraid to read trade journals can read it at their leisure. In fact, if only congressmen and senators could read it, there might be some arousing which would do good all around. Being absolutely in the right, you have nothing to fear in publishing these truths.

These thoughts are here given just to let you know that you have your readers with you. VERITAS.

Baltimore, Md., March 25.

Lackawanna Ousted from North Pier at Buffalo

The most important event of the month in lake shipping circles has been the order of the war department forbidding the Lackawanna railway to moor vessels at the north pier of Buffalo harbor. The decision was quite unexpected and came almost like a peal of thunder from a clear sky. It created great consternation and influences were immediately exerted to have the war department rescind the order. Obviously if vessels cannot be moored at the north pier coal cannot be shipped from the north pier and the Lackawanna is the heaviest handler of anthracite tonnage. It is maintained that for more than thirty years the Lackawanna has illegally occupied this pier. This is apparently the government's first step to regain possession of the pier. The order came from Secretary of War J. M. Dickinson and was transmitted to Col. W. T. Russell, government engineer at New York, with instructions to serve it on President Truesdale of the Lackawanna railroad. The order verbatim is as follows:

"War Department, Washington, March 17, 1911.

"To the Delaware, Lackawanna & Western Railroad Company:

"Take notice that, whereas it is provided by Section 15 of an act of Congress, approved March 3, 1899, that it shall not be lawful to lie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft."

"And, whereas, it is now made to appear to the Secretary of War that the practice of the D., L. & W. Railroad Company of mooring vessels or other craft to the Government North Pier at Buffalo, N. Y., as permitted by regulations approved by the Secretary of War on Sept. 8, 1898, obstructs the passage of other vessels, or craft, in violation of said statute.

Revokes Regulations.

"Now, therefore, the Secretary of War hereby revokes the said regulations on Sept. 8, 1898, in so far as the same permit vessels or other craft to lie singly at the said North Pier at Buffalo, N. Y.; and hereby directs and orders the said D., L. & W. Railroad Company to discontinue the practice of mooring vessels or other craft to said Government North Pier at Buffalo, N. Y., and of anchoring vessels or other craft in the channel alongside of said pier; and hereby prescribes that the revocation and order shall become operative 60 days

J. M. DICKINSON,
Secretary of War."

Buffalo has been the hard coal shipping port of the great lakes. About thirty-one years ago the Lackawanna trestle was first built on the north pier and was regarded as a permanent thing. It is certainly a very convenient place for vessels to load coal, the towing bills being the least possible to get to and from the dock, and little time was consumed in loading there. Vesselmen therefore, and particularly the vessel agents at Buffalo, do not look upon the order very complacently. The Lackawanna is the largest shipper of hard coal from Buffalo and if it is compelled within two months to quit shipping coal over the pier it will reduce considerably the volume of hard coal handled from Buffalo. The other hard coal shipping port is Erie, Pa., to which a considerable quantity of coal naturally will be diverted.

Workman, Clark & Co., Belfast, Ireland, have recently placed an order with the General Electric Co. for electrical equipments for three steamers which they are building for the United Fruit Co. The total equipment for these three steamers includes: Twelve 35-kilowatt turbo sets; forty-two motors for refrigeration and ventilating system, aggregating 520 H. P.; three controlling switchboards, motor controlling panels, etc.; three searchlights.

It is of interest to note that ten steamers have already been equipped and have been in operation for some time and the present order brings the total up to thirteen steamers.

The New Cunard Liner Franconia

IT HAS been said that in the gradual development of the Cunard line may be traced the shipping industry generally, and in the substitution of new ships of superior types the advance of science in relation to the steam ship and marine steam engine may be closely followed. Further evidence, if necessary, of the enterprise and spirit of progression that animates the Cunard company is provided by the magnificent new vessel Franconia, which sailed from Liverpool for New York on her maiden voyage on Feb. 25.

FIRST CLASS DINING SALOON ON THE FRANCONIA.

Though not so large in point of gross tonnage nor built with the object of attaining the unrivalled speed of the express Cunarders, Lusitania and Mauretania, yet the Franconia will embody many features—especially in regard to her passenger accommodation—that will place her in the very front rank of modern liners. The Franconia will be primarily attached to the Boston service, hitherto carried on by the Ivernia and Saxonia. She will be larger and faster than either of the two latter boats, in fact, she will be the largest boat to enter Boston harbor when she is permanently placed in that service. During the winter months she will be attached to the Cunard fleet cruising between New York and the Mediterranean.

The Franconia has been built at Wallsend-on-Tyne by Messrs. Swan Hunter & Wigham Richardson, and her principal dimensions are: Length over all, 625 ft.; breadth, 72 ft.; depth to keel, 90 ft.; gross tonnage, 18,000; displacement, 25,000; height of funnels, 140 ft. above lowest furnace bars; diameter of funnels, 17 ft. 6 in.; height of masts, 200 ft. above the keel.

The vessel has been designed on the graceful lines for which the Cunard boats are noted, at the same time embodying all those features necessary to insure steadiness and seaworthiness in all kinds of weather. In all there will be no less than seven steel decks.

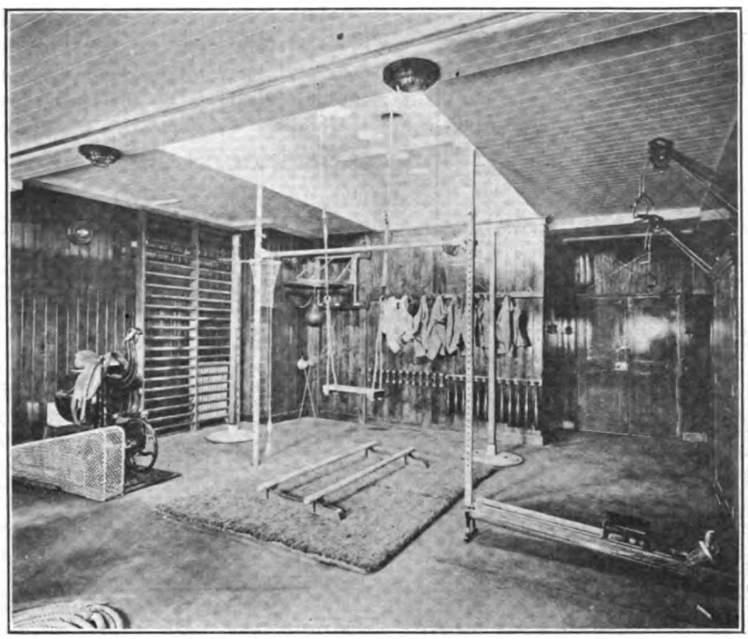
The Franconia is propelled by twin-screw engines of the inverted direct-acting quadruple-expansion type, balanced on the Yarrow-Schlick and Tweedy system, having four cranks to each set. There are four cylinders to each set of engines, namely, 1 H. P., 1 first M. P., 1 second M. P., and 1 L. P. Approximately the diameters are 33 in., 47 in., 67 in., and 95 in., respectively, with a 60-in. stroke.

It is not in respect to size and speed only that the Franconia is so far in advance of the Britannia, the first Cunard steamer to enter Boston harbor. In fact, probably the most remarkable feature of the new boat in comparison with the old, is the extensive passenger accommodation provided and the refinement with which the scheme of decoration is carried out.

The first class entrance, hall and vestibule are decorated with simple Adam's colonial paneling and plaster ceiling, one of the most distinctive features in all good work of the Georgian period; indeed, the style of decoration throughout the ship is what is known in America as "Colonial," and in Great Britain as "Georgian." Never has this famous style been adopted to better purpose. The fullest advantage has been taken of the unique opportunities provided by the varied and spacious apartments in displaying the quiet, grandeur and comfort of the old mansions and country houses typified by the style.

SIDE VIEW OF FIRST CLASS DINING SALOON, CUNARD LINER FRANCONIA.

The dignity and effectiveness of this style is strikingly portrayed in the treatment of the main dining saloon, the plaster ceiling of which is treated with some very delicate ornamentation. The oval panels in the various bays strike a harmonious note with the general surroundings. Besides small tables, the usual type of revolving chair has been substituted by comfortable mahogany arm chairs which, under ordinary circumstances, will not require to be fastened down, thereby giving absolute freedom of movement to passengers.



GYMNASIUM ON THE CUNARD LINER FRANCONIA.

The smoking room is a most comfortable apartment. The paneling of the walls with harewood of a soft pearl gray shade is relieved by inlays of kingwood. A series of columns and arcades tend to break up the sides of the room into comfortable bays, in which are fitted settees upholstered in an old French tapestry of a red color and quite a new and happy idea is the construction of an elliptical retreat at the after end, enabling passengers to obtain an uninterrupted view of the sea over the stern of the vessel.

Adjoining the smoking room is the verandah cafe with its stone walls and green treillage over which ivy is trained, forming a pleasing termination to the public rooms on this deck. Wicker furniture completes the garden effect of this room, while the bay trees in their teakwood tubs give quite a charming appearance to this popular resort.

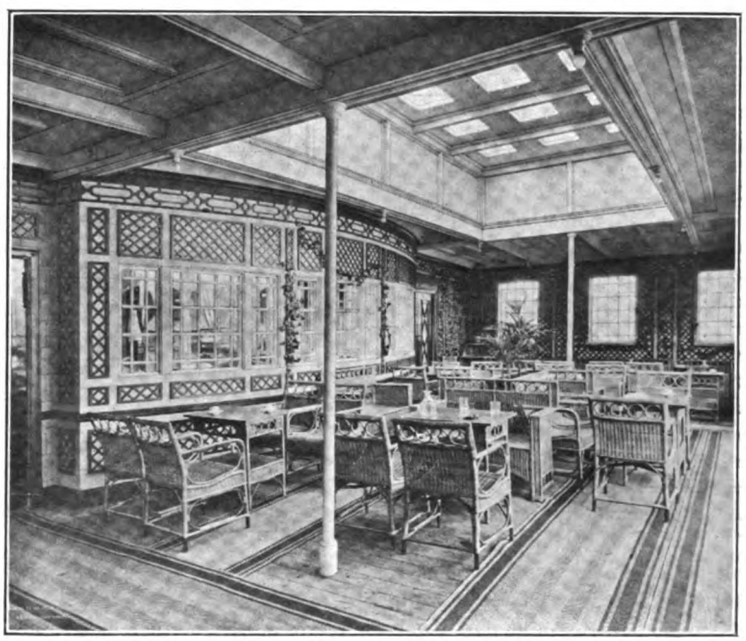
The large dimensions of the first class lounge has given the architect plenty of decorative scope, and the result obtained quite justifies the treatment adopted. The deck of this room has been specially leveled so that the room may be used as a ball room when required, and the floor laid with Austrian oak parquetry. The architectural features have been carefully treated, the wagon-headed plaster ceiling with beautiful fine Adam's ornament and dormer windows, entering harmoniously into the general spirit of the scheme. Close by is the daintily arranged writing room and library, in the decoration of which the keynote is simplicity and restfulness.

The gymnasium is quite a new feature in Cunard vessels, and this one is complete in every detail and is a combination of an Aldershot gymnasium and a German therapeutic institute with a qualified instructor in charge.

The state room accommodation in the saloon class has been given very careful consideration and are fitted with every requirement in the way of comfort and convenience. There are a number of single berth rooms complete, with the latest improvements, including running water for the wash stands, while in the two-berth rooms the system of placing one berth above another has been done away with. In addition, there are a series of "en suite" rooms, consisting of two bed rooms with a bath room between.

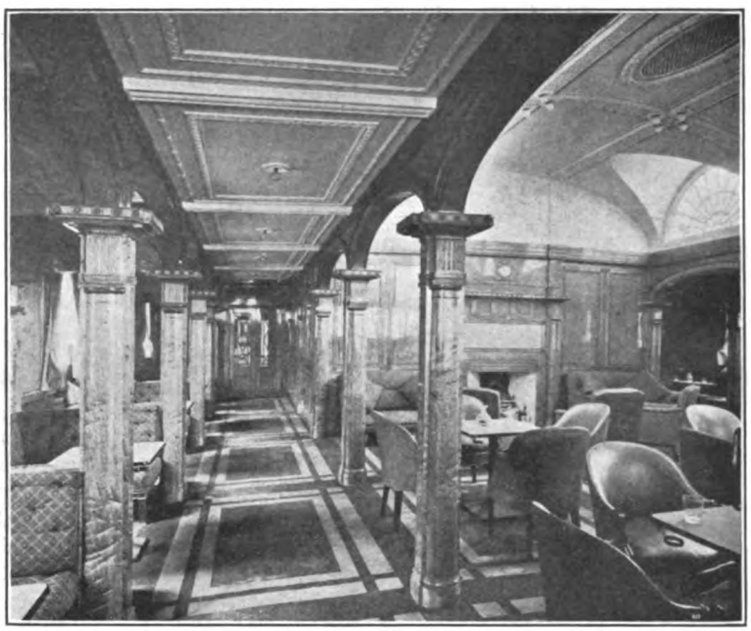
The second class passengers have been catered for upon an unusually comprehensive scale. The ceilings of the public rooms have been leveled down so as to obtain a wide and broad effect. The whole of the second cabin public rooms have been arranged "en suite." This will be greatly appreciated by the passengers, as it will be possible for them to pass from one room to the others without using the stair case. These rooms are also treated in a simple Adam's "colonial" style with white panels.

The striking advancement which marks the accommodation provided for passengers on Cunard liners with what was considered adequate but a comparatively few years ago has not by any means been confined to the saloon and second class cabins. The changes



VERANDAH CAFE ON THE CUNARD LINER FRANCONIA.

brought about by the progress in this direction have been equally beneficial as far as the third class is concerned; in fact, the improved conditions of today



FIRST CLASS SMOKING ROOM, CUNARD LINER FRANCONIA.

are so unlike anything that existed in the early days of trans-Atlantic travel as to be practically beyond comparison.

On the Franconia there are open and covered-in promenades, large and well-appointed dining halls, a comfortable and spacious smoking room, a nicely furnished ladies' room, and a social hall. Passengers are berthed in private rooms, each containing either two or four berths, while a proportion of six berthed will be also reserved for families. All these rooms are well ventilated, heated and lighted.

The ship is fitted with an up-to-date installation of electric light and power and ventilated by numerous electric fans. Electric bells are fitted through the first and second class accommodation. Over 100 miles of electric wires and cable have been used in the installation.

The Franconia after reaching New York will leave on March 11 for a cruise in the Mediterranean, and during the summer will be engaged in the Liverpool-Boston passenger service.

Personal

Walter A. Post, general manager of the Newport News Ship Building & Dry Dock Co. for the past twelve years, has been elected president of the company to succeed the late Calvin B. Orcutt. This is a fitting reward of meritorious work.

Henry Tatnall has been elected president and J. C. Evans vice president and general manager of the Anchor Line of steamers.

Frank J. Sullivan, for several years Cleveland agent of the Tomlinson fleet of steamers, has resigned.

J. J. Parshall, chief steward of the Cleveland & Buffalo Transit Co., has resigned, having purchased the *Geneva Free Press Times,* a daily newspaper.

Patrick H. Hageney has resigned his position as master mechanic of the Union Dock Company's docks at Ashtabula. Mr. Hageney has been in continuous employment on the docks at Ashtabula since 1880 and has taken part in the development of dock machinery since the beginning. His career on the docks has been a most interesting one.

J. C. Workman has been appointed chief engineer of the American Ship Building Co. vice A. P. Rankin, resigned.

Dry Dock at Montreal

A contract has just been arranged between the Canadian government and Messrs Vickers Sons & Maxim, Barrow, for the construction of a dry dock at Montreal, capable of accommodating the largest vessels that are expected to be engaged on the St. Lawrence route for several years to come.

Negotiations with this famous ship building firm have been proceeding for nearly a year, but some months ago a hitch arose with regard to the amount of subsidy payable. This difficulty has been overcome, and the work will be taken in hand almost at once.

At one time plans for a dock limited to vessels not exceeding 15,000 tons were under consideration, but as a result of strong pressure on the part of commercial organizations in the Dominion, the Montreal harbor board decided upon an extension of the scheme.

When the undertaking is completed it will not then be necessary for vessels to repair at Quebec.

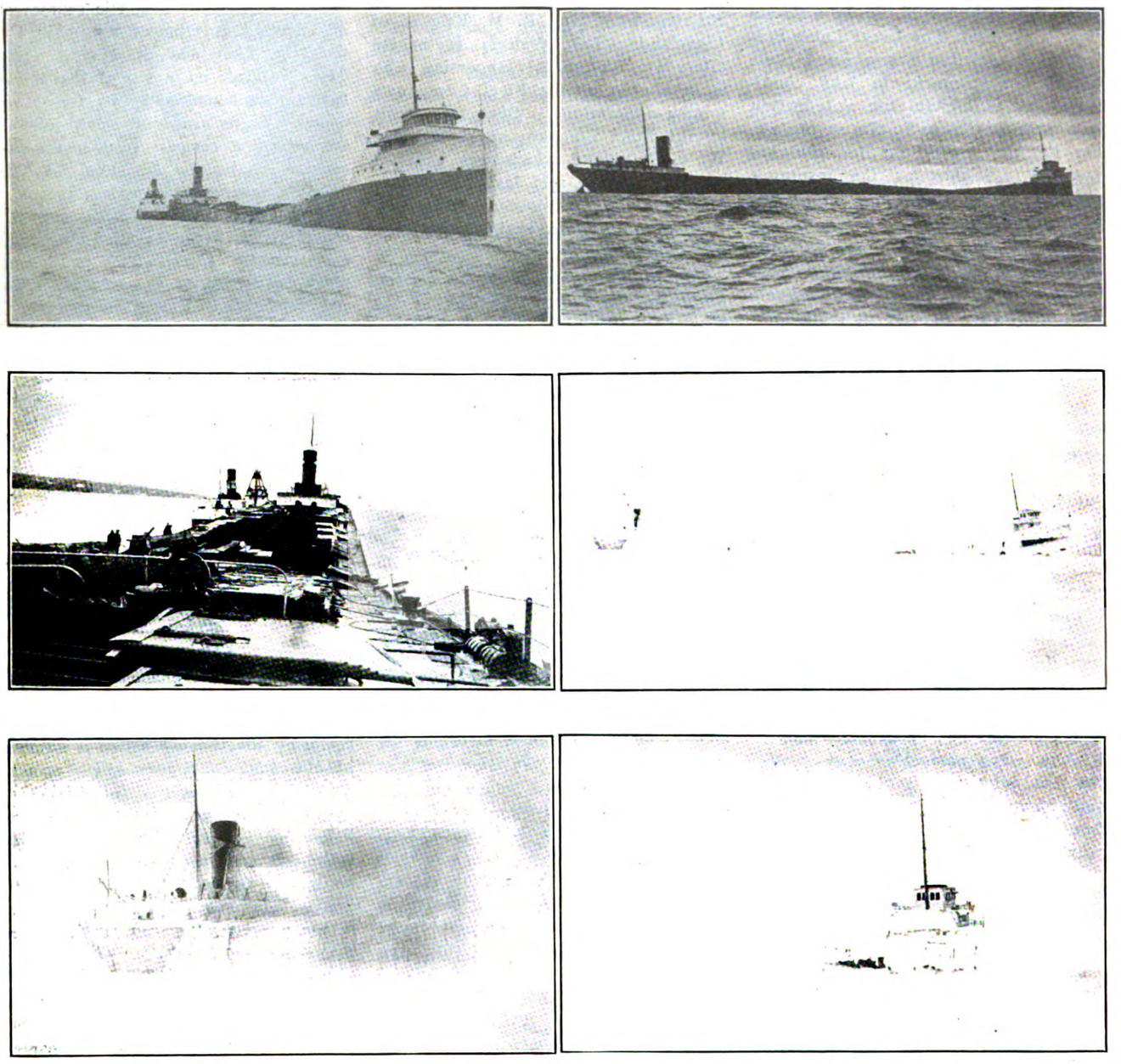
FIRST CLASS LOUNGE, CUNARD LINER FRANCONIA.

Lake Ship Building

Boland & Cornelius of Buffalo have given contract to the Great Lakes Engineering Works for a bulk freighter to be 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep, having a carrying capacity of 9,000 gross tons of ore. As part payment the Great Lakes Engineering Works took over the bulk freighter Yale which was built at Cleveland in 1895. The Ship Building company then sold the Yale to the Port Huron & Duluth Steamship Co., accepting in part payment the steamer Portland (formerly the A. B. Wolvin) which was built in Cleveland in 1900. The Ship Building Co. then sold the Portland to coast interests which have during the past few weeks been buying lake tonnage for ocean service. The Great Lakes Engineering Works is now engaged in making extensive alterations in the Portland to fit her for salt water service. During the past few months Mr. Pessano has sold quite a number of canal sized vessels to coast interests, including the seven whaleback barges which he took from the Pittsburg Steamship Co. as part payment for the new steamers Wm. B. Dickson, W. J. Olcott and Wm. P. Palmer.

The American Ship Building Co. has secured from the Standard Oil Co. orders for three additional barges of Canadian canal size. This makes seven vessels that the American Ship Building Co. is now building for the Standard Oil Co. The barges will be 258 ft. over all and 40 ft. beam and the material for their construction will be furnished by the Carnegie Steel Co. Apparently Mr. Wallace has convinced the Standard Oil people that ton cost of construction is less on the great lakes than on the coast.

Some Graphic Photographs Showing the Wreck of the Bulk Freighter W. C. Moreland as She Lies on Eagle River Reef



THE WRECKERS WILL RESUME THEIR OPERATIONS SHORTLY IN THE ENDEAVOR TO SALVE AT LEAST A PART OF HER.

Lake Freight Situation

Hull insurance on the great lakes will go into effect on April 15 but it is not expected that there will be any general movement of vessels at that time. Insurance rates have not as yet been adjusted and it is too early to state whether there will be any reduction or not from the premium of last year. Certain companies appear to be willing to shade the premium a bit though the most powerful interests apparently would like to maintain it at 6 per cent. The Great Lakes Protective Association has effected some notable improvement in lake conditions and is hopeful for a reduction but exact figures as to the saving under the new conditions for 1910 are not yet available, as the insurance policies for 1910 will not expire for some weeks yet.

A great many vessels are carrying coal in storage at Lake Erie harbors but a number of independent owners have inserted a proviso in their charters that they are not to deliver at the opening of navigation. The early cargoes of coal will doubtless be carried in vessels owned by the shippers themselves as the independent owner is not anxious to send his vessel to the head of the lakes without assurance of a return cargo. There will be very little doing in April no matter what the state of the weather might be. The ice reports indicate that the rivers will be free from ice within a fortnight but no general movement of vessels is expected at that time.

Stages of water are lower this year than last and available draught at the Poe lock will not be greater than 17 ft. 3 in. when navigation opens. Water was quite low last year and cut quite heavily into cargoes but evidently it is going to be lower yet this year.

There has been no talk as yet of chartering in the ore trade but undoubtedly the rates will be the same as last year. The chartering in the coal trade has been upon last year's basis. Opening rates on lumber have been fixed at $2.50 from the head of the lakes to Ohio ports, which is an advance of 25 cents over the rates of a year ago. No season chartering has been done and owners of lumber tonnage like the owners of ore tonnage are reluctant to start their vessels out at the opening of navigation.

The general policy of vessel owners will doubtless be to exhibit the utmost caution in the early months in order to avoid if possible the condition which befell them last year when they were compelled to voluntarily retire 20 per cent of their tonnage in June.

Lake Launchings

The bulk freighter Thomas Walters building for the Jones & Laughlin Steel Co., was launched from the Lorain yard of the American Ship Building Co., on March 25, being christened by Mrs. R. M. Kilgore of Cleveland. The Walters is named after Mr. Walters of Ishpeming who is in charge of the Steel Company's mining operations. She was built by the Steel Company to replace the W. C. Moreland which was wrecked on Eagle River reef last fall and is accordingly a 600-footer, being 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep.

On the same day the American Ship Building Co. launched at its Wyandotte yard the Put-in-Bay building for Ashley & Dustin of Detroit and intended for the excursion service between Detroit and Put-in-Bay. The usual custom of having a young woman as sponsor was departed from in this case, the steamer being christened by Wm. McFall Huyser of Cincinnati, grandson of William McFall of Dayton. The steamer is 240 ft. over all, 227 ft. keel, 46 ft. beam and 17 ft. deep.

1911-1912 Edition Blue Book of American Shipping

THE MARINE REVIEW expects to be able to deliver within a fortnight the 1911-1912 edition of the Blue Book of American Shipping, which is the standard marine directory of the United States. It has been decided to issue the book biennially hereafter instead of annually, believing that in all essentials the requirements of the trade can be met with a biennial issue. Every effort has been made to bring the book right up to the minute and while there are many difficulties in getting a complete list of the addresses of the owners of merchant tonnage it is believed that such as have been procured are accurate. As a guide to the marine trade of the United States the Blue Book is the only work of its kind published. Its price is $5 and it is delivered anywhere in the world, carriage free. Orders should be addressed to the book department, Penton Publishing Co., Cleveland.

Deviation Tables for the Lakes

THE MARINE REVIEW has just issued a new deviation table for the great lakes. The table has been written by a practical lake captain, who has given much time and thought to working out a safe method for checking up and determining compass error.

The tables are made up in book form and will cover a season's work for one steamer.

They contain the magnetic courses on all standard government ranges in Detroit, St. Clair and St. Mary's rivers. They are made up in sets of four sheets, two for up-bound and two for down-bound. There are four blank columns for recording compass reading for two compasses, also the deviation. As the different ranges are passed, a record is noted. Four deviation cards are also provided, which can be filled out at the completion of a trip. This is to complete the record of the compass error, and can be revised from time to time, as most compasses change.

At the top of each book a blank space is provided for recording name of steamer, date of observation and trim of vessel. On the flyleaf of the book is given the simple rule for naming the error, which is sometimes confusing. On the inner side of the flyleaf is the distance from point to point and minutes of time allowed for running the St. Mary's river. The West Neebish channel is included in all the work. The price is 75 cents.

Obituary

Capt. F. D. Herriman died at Washington, D. C., April 6, at the age of 80 years. Capt. Herriman had a long seafaring life, having sailed a number of the famous clipper ships around the horn. He settled in Cleveland about twenty years ago and established the Great Lakes Register. He retired about three years ago and had since then made his home in Washington. His son, Horatio Herriman, is the secretary of the Great Lakes Register.

The seven large steamers operated by W. A. and A. H. Hawgood, formerly owned by single companies have been merged into one company known as the Commonwealth Steamship Co., with a capital of $1,800,000. The vessels included in the merger are the Abraham Stearn, H. A. Hawgood, J. Q. Riddle, Shellon Parks, W. A. Hawgood, Arthur H. Hawgood and W. R. Woodford. They have all been built since 1906 and are representative of the modern type of bulk freighter.

Logan & Rankin

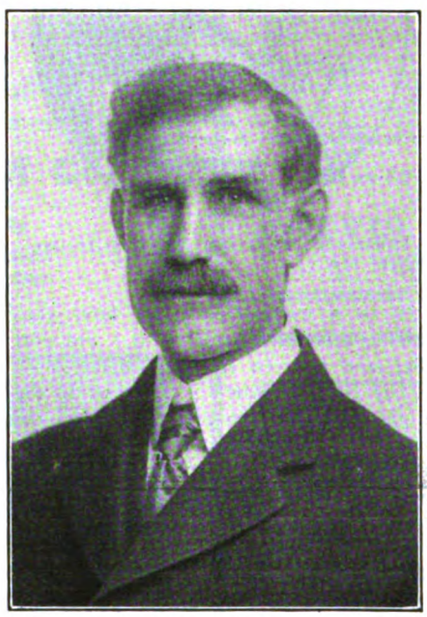
After a separation of nearly 15 years, Robert Logan and A. P. Rankin have again formed a partnership as naval architects and marine engineers, Mr. Rankin having resigned his position as chief engineer of the American Ship Building Co. on April 1. The new partnership is known as Logan & Rankin, with offices in the Western Reserve

ROBERT LOGAN.

building, Cleveland. No two men are better known on the whole chain of lakes and both came to the lakes under somewhat similar conditions.

Mr. Rankin was born in Liverpool, where he attended school and after spending a year in a consulting engineer's office moved to Greenock, Scotland, to be apprenticed to the firm of Rankin & Blackmore, an old and well known firm of marine engine builders. After finishing a five years' apprenticeship which included work in the pattern shop, erecting machine shop and drawing office and working as a journeyman, the firm sent him into Canada to superintend the installation of a large set of engines built by them for the steamer Cibola of the Niagara Navigation Co.'s fleet. After completing that work he was engaged with the Polson Iron Works of Toronto in connection with the building of the C. P. R. steamer Manitoba to replace the Algoma that had been lost.

It was in connection with the building of the steamer Manitoba that he met Mr. Logan, who had gone to Canada in the interests of the C. P. R. to superintend the building of this steamer. Mr. Logan was born in Glasgow and is a graduate of the College of Science and Arts, of Glasgow. He obtained his education in a practical way in the ship yards on the Clyde. After the completion of the Manitoba, Mr. Logan, at the instance of the C. P. R., designed and superintended the construction of the car ferry Ontario, for Detroit river service. Mr. Logan and Mr. Rankin, having many interests in common, decided to form a partnership with offices at Toronto and Owen Sound. They built the Mayflower and Primrose for the Toronto Ferry Co., and the revenue cutters Constance, Curley and Petrel for the Canadian government. They also lengthened the steamer Rosedale and rebuilt the steamer Algonquin and designed and installed the pumping plant at the Kingston dry dock for the Canadian government. They then decided to move to a larger field and accordingly separated, Mr. Logan opening up an office in a consulting line at Cleveland and Mr. Rankin going with the Cleveland Ship Building Co. in 1898. A year later, when this ship building company was taken over by the American Ship Building Co., he was appointed chief engineer. In 1903 Mr. Logan joined the American Ship Building Co.'s force as assistant general manager, becoming general manager a year later, resigning in the spring of 1910 to engage in business for himself.



A. P. RANKIN.

Tunnel Steamer A. M. Scott

The Board of United States Engineers, appointed under act of congress to investigate the best type, and to design and build the best type of tow boat and barges for navigation and transportation on non-tidal rivers, convened at Charleston, W. Va., on Saturday, March 4, to examine, test and report on the twin-screw tunnel steamer A. M. Scott, designed and built by the Charles Ward Engineering Works, and placed at the disposal of the board for this purpose by the company.

The board consists of: Col. Lansing H. Beach, of New Orleans, chairman; Col. H. C. Newcomer, of Pittsburg; Major Charles L. Potter, of St. Louis; Major Charles Keller, of Rock Island, and F. J. French, of New Orleans, secretary.

Messrs. Middleton and Mitchell, of St. Louis, assistants to the engineers, were also present, together with several important river men from Cincinnati and Pittsburg.

The board required the boat to take a tow of six loaded coal barges over the following course, which they considered—"such a trip, though rather short, should develop the boat's steering qualities."

Taking the tow at the Campbell's Creek Coal Co.'s tipple, thence down through Donnally's bar, where the channel is first on the left side to the government light, then abruptly across the river to the right side, making an "S" or reverse curve to enter the channel and avoid the bar, thence under Charleston bridge to the Elk Chute, which is a narrow artificial channel made by wing dams and side walls, about one-third of a mile long, producing very swift water, difficult to enter and usually only accomplished by flanking until properly in line. Below Elk Chute is Two-Mile Shoal, a narrow channel sharply curved its entire length and very long, navigable only heretofore by continued flanking. Thence through Island Shoal, hard to enter, but not difficult, except to approach. Passing this, the channel crosses to the left side to enter Lock 6. After leaving the lock, Tyler Shoals are encountered, where currents are troublesome. Leaving Tyler, is Newcomer Shoal on the other side of the river. Two miles below is Peel Maple, making 16 miles of hazardous navigation.

The Scott took this tow over the entire course without ringing a single backing bell, except while waiting to enter the lock. She showed her flanking power by special request of the board.

After delivering the tow at Peel Maple, the Scott returned to Charleston, where she was put through various maneuvers, loose, turning around by rudder power head-on in this narrow river, backing straight up-stream, steering to port backward and reversing to starboard without stopping her engines,

then manipulating her in similar manner by the engines alone.

In all these tests, the boat fulfilled the builders' predictions precisely.

The pilot, Capt. Albert Martin, had never handled the boat before, and had only been on the boat once before for about half an hour, and then as a guest.

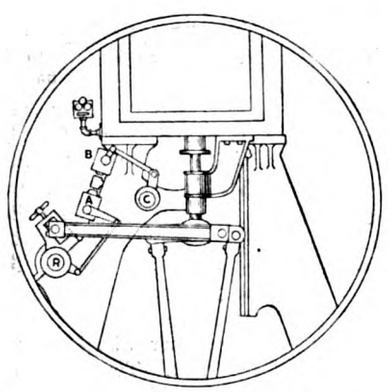
It is the first and only time that any boat has ever *steered* a tow of six loaded barges through these hazardous places. Six loaded barges is the standard tow for the largest towboats taking coal out of this river on 7.3 feet of water.

Col. Beach said:

"Your local engineers and boat builders have new ideas as to river steamers, and are not afraid to go to the expense of proving their worth, as the inspection we made of their steamer, the A. M. Scott, today has shown. The type of steamer which they have evolved and which they showed us in the Scott proved to be a capable boat which was easily handled with a tow of barges and the committee is well pleased with the showing she made."

The Purvis Speed and Direction Indicator

The number of costly accidents to boats this past few years, caused by a mis-interpretation of signals from captain to engineer, has acted as an incentive to inventive minds to devise an infallible means, whereby the movements of the engine may be indicated in the pilot house. In striving for this end, it is evident that in order to

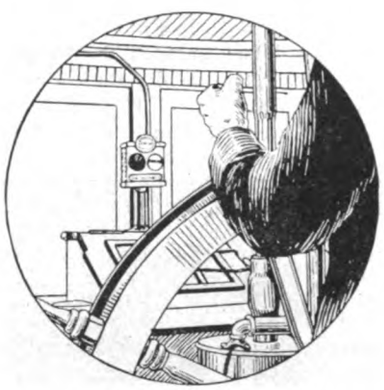


A—Reverse Switch Attached by Rod to Reverse Shaft R.
B—Flashing Switch Attached by Rod to Valve Stem Rock Shaft.

eliminate all possibility of error, the engine itself, and not the engineer, should give the signals. To insure positive and continuous action, too, all mechanical movements between engine and pilot house should be done away with.

The Purvis speed and direction indicator seems to be designed with these points constantly in mind. John B. Purvis, the inventor, has figured that nothing is so positive and unfailing in its action as an electric light, and his long experience as chief engineer on the Great Lakes has qualified him to judge of the actual requirements for such a device.

The Purvis indicator consists simply of a reverse switch to indicate direction, and a flashing switch to indicate revolutions, which are attached to engine parts, and connected by an ordinary three-wire electric cable to the indicators in the pilot house, or such other parts of the ship, as it is desirable to have them installed. The indicator itself is a two-compartment box, containing miniature lights, with a red port dial, and a green starboard dial.



Indicator Installed in Pilot House

The reverse switch is attached to the engine reverse shaft that carries the links, and the moment the links actually go over, that fact is immediately announced in the pilot house by the flashing of the port dial, if set for astern, or the starboard dial if set for ahead. The flashing switch is attached to any reciprocating part of the engine—usually the valve stem rock shaft—and causes a flash in the indicator box, in the port or starboard dial, depending on the direction of the engine.

As each revolution makes a positive contact, it follows that it must work perfectly, the only thing that should interrupt the service being the cutting of the wires themselves, which should be enclosed in a conduit. It is also evident that the indicator shows the direction the engine is set before the engine starts, and registers from the first revolution, which would be impossible were mechanical movements introduced as a medium instead of electric current.

The only expense for up-keep this indicator incurs is the exceedingly small one for current consumed in the two-to-four-candlepower lights, used in the indicator boxes. This can be furnished direct from the dynamo, or from a storage battery, or better still, by a switch transferable to either, in case, for any reason, the dynamo was shut off.

The advantages claimed by Mr. Purvis for his indicator are its extreme simplicity, cheapness of installation and maintenance, its positive action, and the fact that it is altogether noiseless. This last fact will commend it to the navigating officer who, when running in a fog, has his ear strained for the slightest sound.

This indicator was installed last season on the steamer E. H. Utley, and worked all through the season without failing to record a single revolution. To further test it out, indicator boxes were installed in front of the engineer in the engine room, in the chief's room, in the captain's room, in the pilot house and on the bridge. The indicator was further exhibited at the Lake Carriers' convention, in January, in Detroit, and many owners expressed their intention of installing it on a part or all of their fleet this season.

The Purvis indicator is being manufactured by the Purvis Engineering Co., with offices at 611 Moffat block, Detroit, Mich.

Address on Thermit Welding

The Cleveland branch of the American Chemical Society at their March meeting, was addressed by W. R. Hulbert, manager of sales, Goldschmidt Thermit Co., on the Thermit welding process.

In addition to a general description of the process and its various applications with lantern slides, Mr. Hulbert gave a demonstration of Thermit welding, comprising a number of experiments to show how the process is used commercially for repairing wrought iron and steel sections, and for welding pipes up to 4 in. in diameter.

Much interest was shown in the demonstration, which was witnessed not only by the local members of the American Chemical Society, but by members of the American Society of Mechanical Engineers, and others who came from near-by towns.

The Cleveland Punch & Shear Works, Cleveland, has just issued a new edition of its handbook and stock list of machines and small tools for the fabrication of iron and steel. It contains a great deal of information and will be found to be of particular interest to structural iron workers, boiler makers and erectors.

U. S. ENGINEER OFFICE, KANSAS City, Mo., March 30, 1911. Sealed proposals for constructing and delivering steel barges will be received here until noon, May 1, 1911, and then publicly opened. Information furnished on application. Edward A. Schulz, Major, Engrs.

A Large Segmental Bucket

In blasting and dredging a deep water channel in the Delaware river at Schooner's Ledge, near Chester, Pa., some peculiarly difficult problems were faced by the United States government engineers, since the work was done in material consisting largely of rock. The handling of the displaced material with speed and efficiency so as to facilitate the rapid progress of the work, presented some mechanical problems more than ordinarily difficult, owing to the large masses sought to be removed. The solution was found in the adoption of an orange peel bucket of unusual proportions, built by the Hayward Co., 50 Church street, New York City, and shown in the accompanying illustrations. This bucket, which is believed to be one of the largest of its kind ever built, is 16 feet high, 12 feet wide when open, 10 feet wide when closed, and 5 feet deep. The bowl has a capacity of 6 cubic yards and it will seize and lift a single rock weighing up to 18 or 20 tons. The weight of the bucket is 14 tons. The great size of the bucket made it especially valuable by eliminating a large percentage of the drilling and blasting ordinarily required in channel work where very large boulders are encountered and where blasting is necessary, conditions which were found in making the Delaware river channel.

For this rock work, as the design of the bucket shows, the sides of the blades are cut away, allowing parts of irregular-shaped bodies to project through the spaces so made and thus facilitating hoisting adjustment, as well as equalizing the strains in the blades and arms. The bowl in this shape will also dig and raise a considerable quantity of small material, the closed portion of the bowl below the openings being 5 feet 5 inches in diameter and 1 foot 6 inches deep. This form of blade also facilitates running-off the water, leaving only the net load of material to be hoisted from the surface. The blades with sides removed are 5 feet across and weigh, with the arms, approximately 2 tons each.

For operating in soft material or small rock where the bucket will dig and fill to its capacity, plates are supplied and bolted or riveted to the sides of the blades, thus forming the full size closed bowl of 6 cubic yards capacity. This bowl is 10 feet in diameter and 4 feet 5 inches deep, and the distance from the bottom of the lower center casting to the points of blades when closed is 5 feet 3 inches. To the upper lugs of this center casting are secured the frames which support the power wheel shaft on which are fitted the two cams and the power wheel. The cams are 12 inches face and are designed to give a minimum and maximum power at the points where most needed during the operation of digging. The power wheel is 5 feet in diameter, 12¾ inches face and will accommodate a 2-inch diameter operating or closing chain. The power wheel shaft is 6 inches in diameter and is supported at four points by the inner and outer power wheel frames.

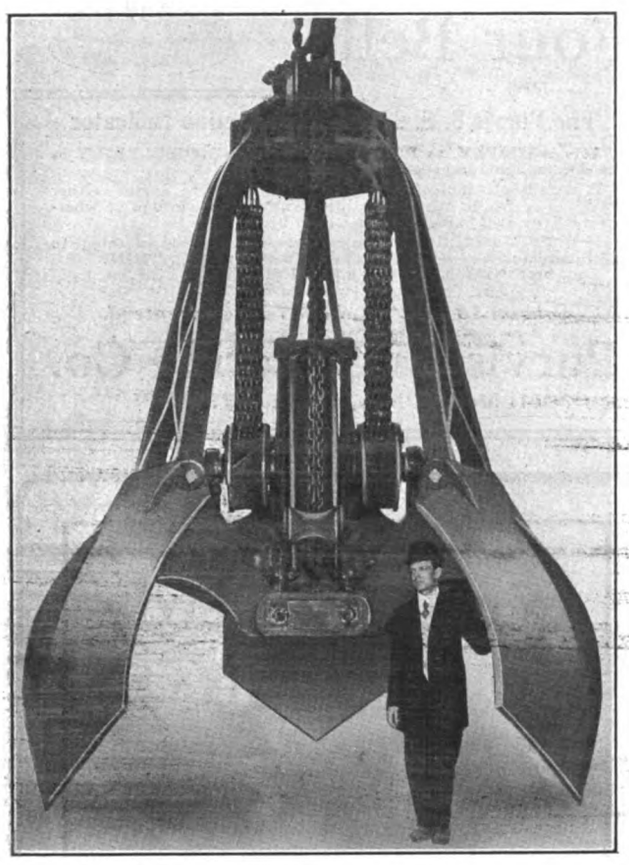


FIG. 1—SEGMENTAL BUCKET WITH BLADES OPEN

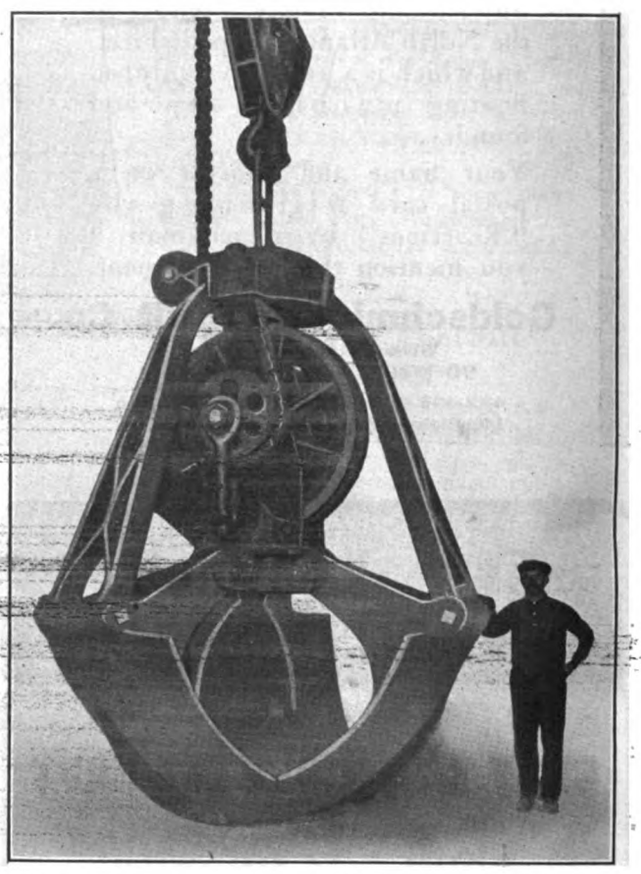


FIG. 2—SEGMENTAL BUCKET WITH BLADES CLOSED

The inner power wheel frames extend to a point above the power wheel, where they are connected by a casting which also acts as a stop when the bucket is entirely closed. The outer power wheel frames are of forged steel.

The side, or cam chains, are made up of 180 links of 3 x ¾-inch steel and 1⅛-inch rivets and when the bucket is open, extend from the upper center shaft a distance of 7 feet 4 inches to the cam pins.

The upper center and blade arms are connected by forged steel connecting rods 8 feet 6 inches long weighing about 1,250 pounds each.